Engineering News-Record

McGraw-Hill Publishing Company, Inc. April 29, 1937 Twenty-five Cents, Five Dollars per Year

City Engineering Number

Photo Aerial Explorations Inc.

HOW TO WIN THIS GAME OF *Bridge*

REPUBLIC STEEL

REG U.S. PAT. OFF.

TONCAN

COPPER MO·LY·BDEN·UM IRON

HIGHEST RUST-RESISTANCE IN ITS PRICE CLASS

Above: On railroad bridges, engineers are defeating corrosion caused by sulphuric acid and other drippings from coal and refrigerator cars by installing corrosion-resisting Toncan Iron plates. . . . In insert: When removal of a section of superstructure on the Brooklyn Bridge necessitated facing, Toncan Iron was selected.

In this "game of bridge," your opponents — corrosion and vibration — are crafty and relentless. Never do they pass an opportunity in their attack. Stakes are high — running into thousands of dollars. To win requires your skill and experience as an engineer — and it requires as a partner a dependable line of construction products.

Alert engineers all over the country are teaming up with Republic steel products — sheets, plates, pipe, tubing, bars, bolts, nuts, rivets, turnbuckles, wire rope clips, nails, wire and other items made of steel, copper-bearing steel and rust-resisting Toncan Iron — and these engineers are winning not only in bridge but in all types of construction. Complete detailed information on Republic steel products will be sent upon request. Write today.

Republic Steel Corporation

GENERAL OFFICES . . . CLEVELAND, OHIO

"When writing Republic Steel Corporation (or Steel and Tubes, Inc.) for further information, please address Department EN."

Beyond the City Engineer

THIS issue of Engineering News-Record is devoted chiefly to city engineering. It discusses in broad terms the planning, design, construction, maintenance and operation of the diversified facilities that now are so essential to community existence.

Today those facilities no longer can be considered apart from the private property and concerns of city-dwellers. They have become in large measure the limiting and determining factor in those concerns. The modern city is not merely a collection of private dwellings, stores and factories, jointly served by a few elementary communal facilities; *it is a vast and integrated plant for community living.* The public works and structures provided by the city are the essential framework of that plant; on them all private activities have become increasingly dependent.

Every interest of the individual citizen, whether he be wage-earner, industrialist, business man or merely a resident, is affected by the adequacy and efficiency of that plant. His ability to transport his goods and his person, the availability of workers to carry on his business, the supplies of water and sanitary conveniences required to maintain his standards of living, the protection of his health and physical safety, the value, earning power and security of his property—all these are profoundly affected by the administration of those public facilities that are comprised under the general head of city engineering.

THE vision and technical skill of the city engineer have become, therefore, matters of intimate and practical concern to all of his fellow citizens. His economic judgment will affect the current value of their property; his energy and integrity will conserve the long term prosperity and welfare of the community upon which they must plan and build their private fortunes. The growth of the modern city has established the professional and personal competence of the city engineer as a factor of major influence in the life of every city dweller. The contents of this issue reflect, all too inadequately, the scope and weight of that influence.

But above the city engineer stands another group that in turn exerts a substantial influence for better or worse on his work. These are the laymen who compose city councils, commissions and other municipal governing bodies. Whatever may be the technical and personal competence of the city engineer he must work under the limitations imposed upon him by these bodies. His vision will be subject to their vision, his energy will be controlled by their energy, his performance will be measured by their capacity to understand and administer the physical situation and facilities of their cities. They are in position to foster or frustrate the best efforts of the best qualified city engineer.

IN the exercise of this vital function those who compose these groups labor under certain traditional handicaps. Usually they are laymen, untrained in the technical aspects of city planning and improvement; generally they are of limited tenure of office and unable to take a long view of their city's physical problems; frequently the political aspects of city administration tend to weigh more heavily than do the economic or technical. With the most honest intentions in the world, members of such governing bodies find it difficult to keep abreast of the rapid development in municipal services and to deal wisely with the complex problems that are involved in rendering them. To help them do this has become an important function of the city engineer who would measure up to the responsibility imposed upon him by the needs of his clients, i.e., those who live in his city.

It is possible that in these pages some of our city engineer readers may find help in doing this. Perhaps they can bring this issue or its contents to the attention of their commissioners, elected officers or the members of their city councils. If this City Engineering Issue thus can perform a service of value to municipal engineering even beyond the circle of its regular readership, the editorial staff and the distinguished contributors who have made it possible will feel no small satisfaction.

Willard Chevalier

ENGINEERING NEWS-RECORD Published every Thursday. Vol. 118, No. 17. Price 25c per copy. Subscription, domestic, Canada, Mexico, Central and South American countries, $5 per year. All other countries, $9 a year or 36 shillings. Entered as second-class matter October 29, 1936, at the Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Cable address "McGrawhill New York." Member A.B.P. Member A.B.C.

Copyright 1937 by McGRAW-HILL PUBLISHING COMPANY, INC.

Editorial and Executive Offices: 330 West 42d St., New York. Publication Office: 99-129 N. Broadway, Albany, N. Y. Branch Offices: 520 N. Michigan Ave., Chicago 883 Mission St., San Francisco; Aldwych House, London, W. C. 2, England; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

JAMES H. McGRAW, JR., Chairman — MALCOLM MUIR, President — JAMES H. McGRAW, Honorary Chairman
WILLARD CHEVALIER, Vice President — B. R. PUTNAM, Treasurer — D. C. McGRAW, Secretary

Table of Contents — See page 39

AMERICAN CONCRETE and STEEL PIPE COMPANY

After many years of research ANNOUNCES

*AMERCOAT: protection for severe outfall and interceptor sewer conditions

Acid-proof Lining and Coating for Concrete Sewer Pipe and Structures. It is a Plastic, not a Paint.

* AMERCOAT is inert to acids and gases encountered in septic sewage, trade wastes, and other destructive liquids.
* AMERCOAT may be applied centrifugally in pipe, or can be applied to all concrete structures by trowel.
* AMERCOAT has a firm and tight bond to concrete.
* AMERCOAT hardens with age but remains slightly plastic. Under hammer blows it will dent but not shatter.
* AMERCOAT is abrasion resistant for sewers, waste lines, sewage treatment plants, etc.
* AMERCOAT is a chemically inert material unchanged by age.
* AMERCOAT is unaffected by heat or cold within the range of United States climatic temperatures, and being plastic is unaffected by temperature shrinkage or expansion.

* *Patents Applied For*

Write for Additional Information

AMERICAN CONCRETE AND STEEL PIPE COMPANY

P. O. BOX 1428, ARCADE STATION, LOS ANGELES, CALIFORNIA

Tacoma Oakland Los Angeles San Diego

ENGINEERING NEWS-RECORD

McGraw-Hill Publishing Co., Inc.

Editorial and Executive Offices: 330 West 42d St., New York Publishing Office: 99-129 No. Broadway, Albany, N. Y.

Editorial Staff
V. T. Boughton
W. G. Bowman

Chicago
W. W. DeBerard

F. E. Schmitt, *Editor* Willard Chevalier, *Vice-President*

Volume 118 Number 17 Copyright 1937

Editorial Staff
C. S. Hill
H. W. Richardson
E. J. Cleary

San Francisco
N. A. Bowers

April 29, 1937

City Engineering Number

The cover is the business section of Kansas City, Mo.

To Build Better Cities 613
Who's Who in This Issue 614

Past Performance and Present Outlook

Back from the Depression ..... *Clifford Ham* 615
The Job Ahead ..... *Roy N. Towl* 617
Focusing on Finance ..... *Frederick L. Bird* 620

Practice and Planning

Building to a Program ..... *J. C. Schwada* 623
New Streets for Old ..... *George B. Sowers* 625
Street Maintenance ..... *William B. Shafer* 628
Water Supply and Sanitation ..... *Samuel A. Greeley* 631
Guiding Growth ..... *Robert Kingery* 635

City Works Administration

The Modern City Engineer ..... *Loran D. Gayton* 637
Organization and Personnel ..... *E. P. Goodrich* 639

Editorials 644
Current News 646
New Equipment 653

■

Fourteen Million Dollars a Mile—is what New York City is paying for construction of the Sixth Avenue section of the Independent Subway. No more difficult subway construction has ever been undertaken than is involved in this 2¼-mile underground line which is to be described in next week's issue.

Traffic marker of Atlas White portland cement, on Wayside Drive, Houston, Texas. Contractor—Gulf Bitulithic Company of Houston.

Once in—they're in for good!

● No "extras" will ever be required with this traffic marker. Once in, there's no extra work—no extra expense. Its first cost is the last cost.

This *permanency* is a big factor in the success and growing popularity of markers made with Atlas White portland cement. When Atlas White markers go in, maintenance worries go out. Repairs are not required. There is no fuss, bother or expense of re-marking.

Atlas White markers never fade out, never wash away. They stay white year after year—clean-cut, easy-to-see guardians of life and limb.

For country highways or city streets. For old or new pavements of any type. Installation can be made in coldest weather. Precast sections, made indoors, are simply moved to the job and set in place. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), 208 South LaSalle Street, Chicago.

Help Build Safety into Streets and Highways with Atlas White Traffic Markers—Made with Atlas White Portland Cement—Plain and Waterproofed

USS

M10

ATLAS WHITE PORTLAND CEMENT
FOR TRAFFIC MARKERS

ENGINEERING NEWS-RECORD

City Engineering Issue, April 29, 1937

To Build Better Cities

New Municipal Building at Dover, N. H.

DURING half a decade of enforced retrenchment, city improvement and maintenance has been all but paralyzed. Now the period of stagnation is over and municipal public-works activity is once again under way. Its revival comes at a time when a huge backlog of unfilled needs has accumulated and when the financial and economic condition of cities has taken on a highly favorable aspect.

Many worn-out facilities are in need of replacement, and services of all types require extension in step with growth. At the same time the citizen expects enlarged facilities, to meet today's higher standards of community existence. Taken together these demands represent an enormous volume of work to be done. With better tax collections, with money at low rates of interest, and with municipal bonds finding a ready market, the stage is set for intense activity in urban development.

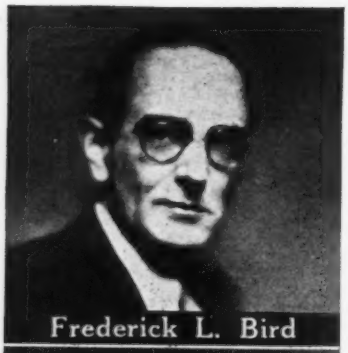
FEDERAL assistance has supported municipal improvement work for some time past. There are many who believe that through this aid the needs of cities have been amply taken care of and that improvement work can now be curtailed rather than extended. Nothing could be farther from the truth. Each year since 1931 the expenditures of cities on public works have remained nearly a billion dollars below those of the years just preceding, and a deficit of fully five billion dollars has accumulated. The actual deficit is even larger, for standards of living are today distinctly ahead of those prevailing in the '20s and there is unmistakable demand that cities shall improve their equipment to meet these standards.

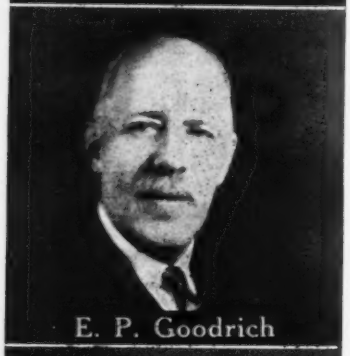
Streets inadequate for modern traffic are no longer accepted without protest; better sanitation and waste disposal facilities are needed; water-supply systems and public buildings call for modernizing; more recreational areas and the elimination of slums are demanded. In every branch of municipal equipment there is more to be done than merely wipe out the depression deficit in improvements; the city engineer is asked to build a better city.

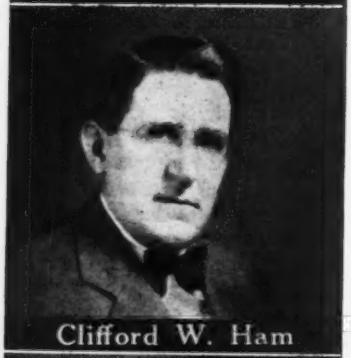
This task is one of tremendous scope, and one that can be successfully carried out only if past practices are revised. Already many cities are looking ahead and drafting long-time programs, physical as well as financial. By so doing they are enabled to spread their tax burdens more evenly and assure themselves of adequate time for effective planning. What every city engineer has long known, namely that large undertakings often require a full decade between conception and final realization, is thus at last receiving official recognition. As this major advance in city public works practices goes forward, the new era of municipal development will make effective progress.

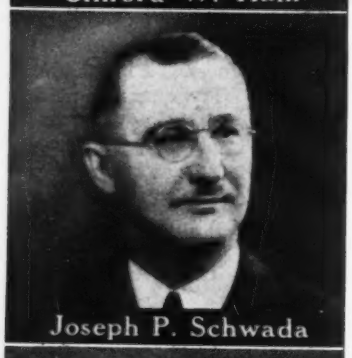
In planning needed improvements, in setting up advance programs, in establishing priorities and making definite yearly budgets, the city engineer is a key figure in building the future of his city. The essential position he has occupied heretofore in designing and constructing public works is taking on greatly increased importance by reason of these broader responsibilities. Three major functions devolve upon him: to carry on farsighted planning in drafting a program of improvements; to guide financing of the work along sound lines; and finally to maintain an effective technical organization for execution.

A SYMPOSIUM of special articles has been assembled in this issue of *Engineering News-Record* to assist the engineer in preparing for the task of city development under these new conditions. Written by outstanding authorities, the articles present a critical appraisal of the leading phases of public works activities. They outline significant changes in city affairs, and then take up one by one the important technical and administrative practices entering into the day's work. They summarize the successful approach to the task of building better cities, as interpreted by practical city engineers and officials.


Frederick L. Bird


E. P. Goodrich


Clifford W. Ham


Joseph P. Schwada

George B. Sowers

Who's Who

In This Issue

◀ **Frederick L. Bird,** director of municipal research, Dun & Bradstreet, Inc., is a graduate of Lafayette College (1913) and holds a Ph.D. degree from Columbia. His various activities include lecturing on government, editor of the Municipal Administration Service Monograph, financial adviser to the National Emergency Council, and consultant to the Rural Electrification Administration.

▶ **Loran D. Gayton,** city engineer of Chicago, has been connected with the bureau of engineering of that city for 23 years. Some major municipal projects carried out under his direction are: the Western Ave. water pumping station; straightening the Chicago River; the Chicago Ave. water tunnel system; and a $12,500,000 program of bridge construction.

◀ **E. P. Goodrich** graduated from the University of Michigan in 1898 and was engaged on harbor work in New York until 1907 when he entered private practice. He has been active on all types of projects, from designing harbors to planning cities in many parts of the world. One of his special interests concerns municipal personnel and organization problems on which he has been called to advise more than 100 cities.

▶ **Samuel A. Greeley** was graduated from Harvard in 1903, and M.I.T. in 1906. Until 1910 he was employed by Hering & Fuller on sewage disposal problems and then spent a year in Venezuela on sanitary investigations. In 1912 he was engaged by the Sanitary District of Chicago on studies of the Illinois River, lake diversion, and treatment plant design. Since 1914 he has been in private consulting practice.

◀ **Clifford W. Ham** is executive director of the American Municipal Association, a federation of leagues of municipalities in 7,000 cities. He has had 15 years' experience as a municipal official and was at one time president of the International City Managers Association. He is a consultant on finance and administration.

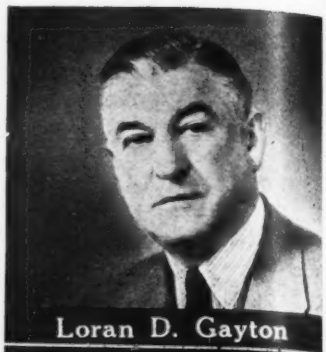
▶ **Robert Kingery** has been general manager of the Chicago Regional Planning Association since its formation in 1925. During the World War he was attached to the construction staff at Camp Custer after which he was associated with the Portland Cement Association until 1925. In 1933 he was drafted for a three year period by the state of Illinois to take charge of its department of public works and buildings.

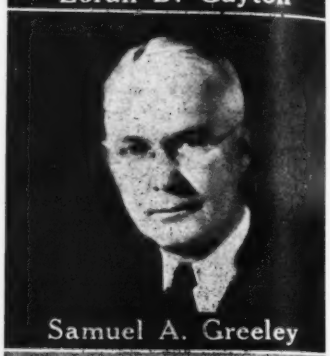
◀ **Joseph P. Schwada,** city engineer of Milwaukee for the last 14 years, gained his early engineering experience as a structural designer. In 1921 he was placed in charge of waterworks construction for Milwaukee and shortly thereafter became city engineer. Largely as the result of his efforts to supply the city with filtered water, one of the most modern water purification plants is now well on its way to completion.

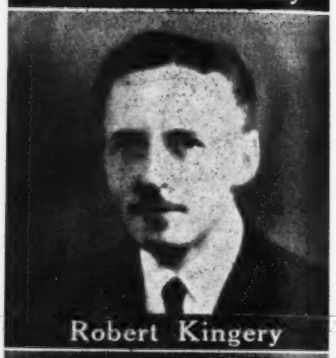
▶ **William B. Shafer,** superintendent of the Bureau of Highways and Sewers, Pittsburgh, is a Cornell graduate, class of 1898. For a number of years he specialized in the design and erection of steel structures. His experience in highway work dates back two decades and covers important roadbuilding projects in Maryland, Delaware, and Pennsylvania.

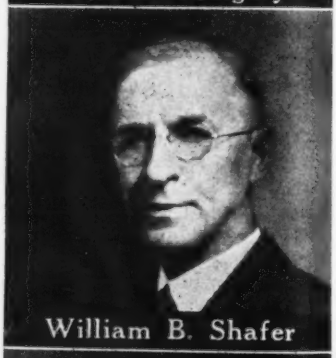
◀ **George B. Sowers,** chairman, Cleveland Port and Harbor Commission, is a consulting engineer of 25 years' experience in municipal work. For 19 years he was city engineer of Cleveland. Malcolm S. Douglas, co-author with Mr. Sowers, is assistant professor at the Case School of Applied Science in charge of highway and construction courses.

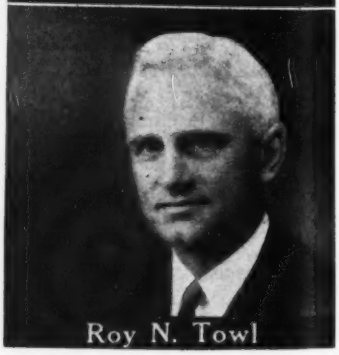
▶ **Roy N. Towl,** consulting engineer and until recently mayor of Omaha, gained his first engineering experience on the Union Pacific R. R. Since 1904 he has been in private practice and much of his work has been on drainage and reclamation projects. Mr. Towl served on the Omaha city commission for nine years.


Loran D. Gayton


Samuel A. Greeley


Robert Kingery


William B. Shafer


Roy N. Towl

● PAST PERFORMANCE AND PRESENT OUTLOOK

Back From the Depression

Dominating the development of our cities as they rise from the lethargy of the depression are new forces resulting from the social, political and economic changes that have occurred

Clifford W. Ham
Executive Director,
The American Municipal Association,
Chicago, Ill.

LASTING BENEFITS have flowed from the depression from which this country is emerging. A clear conception of those benefits and of the value we may draw from them will go far to offset the penalties that have been inflicted. We have started the long journey back. Those concerned with public administration must not only take stock of the penalties but must also capitalize on the benefits.

Throughout the tough days since 1929 one thing stands out with strong emphasis; government does not—cannot retreat. One direction only is possible and public services do not diminish in number or intensity. No functions of government have been dropped from the list during this depression. No one suggests fewer parks, less adequate fire protection, less frequent garbage collection, shorter school periods, discontinuance of sewer and water systems. On the contrary, government is constantly pushed forward in the performance of additional functions.

Increased service demands

We are all cognizant of significant changes in the social, political and economic life in this country that have taken place since 1929. This is not the place to review those changes. The challenging and well-known fact is that even at the low point of public revenue and finance, enlarged government services were insisted upon and the tempo of those services was stepped up. People in all walks found their dependence on and therefore their interests in all levels of government (federal, state and local) greatly increased. And they have been fashioning governments into new instruments for service as demands have been met.

As an illustration of this continued demand for governmental services, I refer to results from a questionnaire I have used to obtain from groups of people, their notions as to whether or not local governments were adequately serving their needs. The first question asked has been "What services (functions) is your city now performing which in your judgment should be discontinued?" Very few and generally no answers are obtained to this question—citizens are unable to specify particular services that they think should be discontinued. To the second question, "What services now being performed by the city should be expanded and made more effective," many answers are received. Increased frequency in garbage collection, increased park and playground programs, expanded additional educational facilities, improved water supply and street paving constitute but a few of the suggestions that are usually made for increased and expanded public service. The third question, "What new services not now being performed by the city should be assumed and rendered by it," brings more answers than either of the others. The public can suggest many things that should now be assumed as part of governmental activity; public housing for example. It is this continued demand for more service that has resulted in governmental functions being increased by 300 per cent in the past quarter century.

"We cannot think of public works merely as a construction job, nor can we hold that one day all construction will be completed and then public works as such will be of but minor importance. Construction is but one phase in the cycle of progressive growth. Cities are not static and public works, therefore, are a continuing normal function embracing the planning, financing, construction, maintenance, and operation of the physical structure of a municipality."

Accumulation of needs

City governments during the depression years were engrossed with the job of daily meeting the exigencies of the moment. Regular programs of construction and maintenance of public works were drastically curtailed and in many cases abandoned entirely. As a result, communities are now faced with accumulated public works needs of every kind. New pavement, new water supply, new sewage treatment works and a host of other types of public works which have been left undone for many years must receive prompt attention. Likewise, there is an accumulated deficit in the maintenance of existing structures.

However, all has not been loss during the past several years. Certain definite advancements have been made and new conceptions of public needs have been crystallized. In the first place public works programs are now recognized as being continuing in their nature. We cannot think of public works merely as a construction job, nor can we hold that one day all construction will be completed and that then public works as such will be of but minor importance. Construction is but one phase in the cycle of progressive growth. Cities are not static and public works therefore are a continuing normal function embracing the planning, financing, construction, maintenance and operation of the physical structure of a municipality.

New conceptions of public finance have emerged and sound principles of subventions and grants-in-aid are being developed through federal funds to states and local governments, and through state funds to local governments. Experience is being gained

with the device of revenue bonds and the establishment of sewer rental charges. The dependence of governmental units upon each other and the interdependence of the function of public works upon the other functions of government has been emphasized. All this has come to constitute an integral part of the drive for balanced programs of public service.

Likewise, development of the techniques of public administration has gone forward remarkably. National associations of public officials have established full time secretariats with highly qualified personnels for study, research and dissemination of information along various functional lines. A number of these organizations have established their headquarters in adjacent offices in Chicago. Coordinated study and assistance is thus possible in working on related problems, on the results of research and on the experiences gained in the field.

Leagues of municipalities in 41 states are carrying intensive programs of cooperative assistance between the municipalities. Some 7,000 cities are now members of these state leagues. Since cities are creatures of the states, and their powers and authorities are subject to state laws and state constitutional provisions, it is quite natural that research and information should be handled by individual, self-contained state units.

Planning and financing

If future programs of public works are to receive proper attention it is essential that we address ourselves to some of the problems inherent in the proper performance of their function. Long term planning is an integral part of a sound works program. Little argument need be advanced these days to justify the need for the careful planning and integration of public works with developments in all other phases of public service. The federal government has given great impetus to state and local planning through the work of its National Resources Committee and through assistance to the state and regional planning groups. The marshalling of data on such problems as water supply, soil erosion, flood control, etc. has gone far in the past few years to vitalize the whole field of long term planning.

State and local communities, in the prosecution of their works programs, have yet to bridge the hiatus that exists between the realization of the value of this long-term planning on the one hand, and the necessity which confronts them of short term (annual or bi-annual) appropriations and the universality of short-term tenures of legislative and appropriating bodies. Many excellent plans have never been effectuated because of this changing picture and because of the inability to make finance commitments on terms commensurate with the plan. Extravagant losses and disjointed development, as well as a serious reflection on planning itself have been the result. Approved plans are never committed plans. Objectives are too often lost in the fog of changing administrations or are side-tracked by the pressure of more immediate need and more dramatic demands upon public finance and public attention.

Financial reservoirs

We have discovered too, that while there is a continuing demand for public works the "ability to pay" is a variable factor. Financing requirements of local communities, dependent solely upon the private finance markets, are most difficult to meet at the very time when they are most essential. What is needed, therefore, is the establishment of a continuing reservoir of public credit constantly available to communities so that programs can be planned independently of the fluctuations in private finance. This does not mean that the national government should continue to finance local public works programs. Its readiness to serve in that capacity, however, should be established, and mechanics should be worked out whereby local governments can outline public works projects with some assurance that capital will be available with interest rates low enough to enable the cities to proceed. This might also result in the complete revision of the issuance of public credit and the consideration of a central public credit bank whose resources would be available for state and local financing. The federal government through RFC, and later through PWA greatly assisted in meeting these requirements. Loans made through these sources aided in a widespread program of local public works. Such a reservoir should be continued.

The public works program should not be made part of any plans for a changing public economy. We have allowed it to become emmeshed with the programs of monetary reform, industrial recovery, public relief, foreign trade and similar economic problems. But it should stand on its own merits of providing serviceable and needed projects irrespective of what form of national emergency or economy is ascendant at that particular moment.

Taxation must be adjusted

Sound state and local financing cannot be promulgated without giving consideration to the whole field of overlapping and conflicting taxation. Local finance, and particularly public works financing, has in the past depended too largely upon revenue from real estate taxes.

Revenues should be assessed and collected by those units of government best fitted to perform that job. These revenues should be redistributed for the support of functions and the functions should be performed in turn by those units of government best equipped. Collection of public revenues on the one hand, and the expenditure for public services on the other, are two separate operations and may or may not be soundly administered by the same unit of government. Further development of the principles of state and federal collection and local redistribution of public revenues is badly needed as is the constant study in the redistribution of governmental functions. Further expansion of the principle of grants-in-aid is but a part of this consideration.

Public works projects, including federal projects, should be economicallly sound in their conception. I have the feeling that the true conception of public works has been distorted because certain projects, initiated under the guise of public works, were nothing more than pure experimentation. I have no quarrel, however, with the federal government for expending funds for experimentation. A liberal amount of expenditure for such purposes is commendable; it is only by these means that we can cross new frontiers and make progress. Experimentation, however, should be labelled as such—the function of public works should not be burdened with the function of experimentation which is an entirely separate matter.

Gaining public support

Public works programs are dependent in the last analysis upon an informed public. This is particularly true in local communities frequently confronted with more dramatic programs where it is difficult to keep public attention centered upon a long term objective. Citizens in most American communities are not fully enough informed as to their own community problems.

Bureaus of governmental research have been established in a number of cities and for many years have been doing exactly this thing. But they are too few in number despite the fact that their history has repeatedly demonstrated the usefulness of this unbiased, disinterested approach to community problems.

In a word then, public works programs are a continuing, normal function of government. The inherent difficulties of planning, financing and executing such programs can be solved through persistent development of sound techniques, and the proper marshalling of facts unaffected by attempts on the part of fact-gathering agencies to confuse that function with the promotion of particular improvement programs.

The Job Ahead

A survey of city needs reveals that a huge reservoir of work has accumulated which includes not only deferred maintenance but construction of new facilities to meet growth needs

Roy N. Towl
Consulting Engineer and Former Mayor, Omaha, Neb.

THE immediate necessity for cities to catch up on deferred maintenance and provide new facilities to meet growth requirements constitutes a huge reservoir of work to be done. Deferred maintenance deserves first attention in the rehabilitation of rundown services but equally compelling are the demands to make improvements to better serve the public. Every new discovery or adaptation of an old one requires readjustments and improvements. The automobile, for instance, has changed the entire pattern of urban life and made necessary a redesign of all traffic facilities. And this one item of increased speed brings on an avalanche of demands. Planning of city growth must perforce include a critical analysis of present needs integrated with future requirements.

In a survey of a city's program of rehabilitation, and modernization the following are typical services needing consideration: Street width and pattern must accommodate modern traffic. Proper lighting is highly essential. Sanitary requirements call for a close check of storm and sanitary drainage systems as well as of street cleaning and waste disposal facilities. Improvements in water storage, purification and distribution must be such as to provide an ample supply at adequate pressures. Public buildings need modernization. Well placed parks and recreational centers are comparatively new items but have proved essential for maintaining stability of growth and prevention of blight.

Street designs of today are generally based on 10-ft. traffic lanes, hence in widening programs lanes should be marked in this multiple of width to aid vehicle movement. Channelization is one of the latest features in overcoming the bewilderment of motorists at irregular intersections as well as providing pedestrian safety. Raised car loading aisles in streets are obstacles to traffic yet on wide city streets they are highly essential to safeguard the pedestrian. Without traffic signals on many congested streets traffic would stagnate; the range of signal devices is from simple warning slow signs to the highly developed progressive light system in use on metropolitan boulevards.

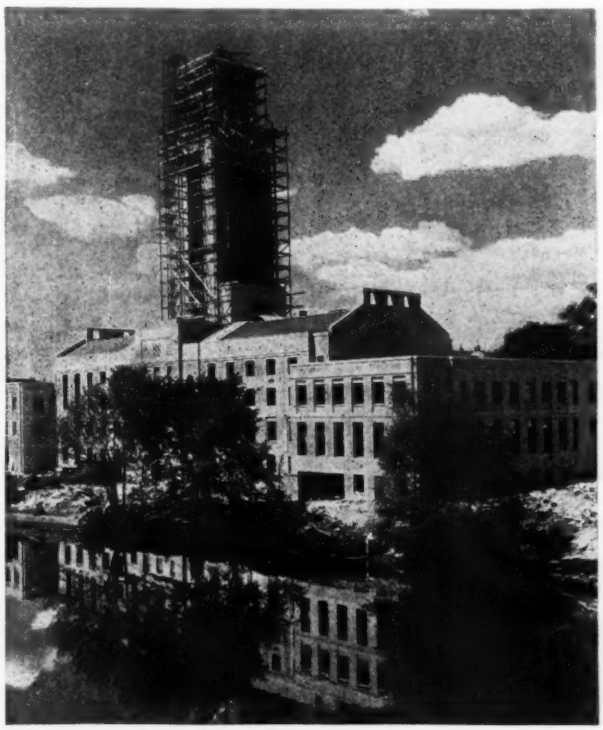


FIG. 1—PUBLIC BUILDING construction and modernization are big items on the municipal improvement "must" program. The above is the new city hall for Pawtucket, R. I.

In a large street rehabilitation program such as Chicago has undertaken, numerous low-cost methods have been developed from simply turning over bricks to crushing them and filling them with grout or an asphalt mixture; miles of macadam have been resurfaced with bituminous materials and ingenious methods of laying the latter have been perfected. Most of the street surface rehabilitations throughout the country in the last few years have been carried out through some form of federal assistance. Entirely new pavements have been laid on arterial streets largely through state and county aid. Many strictly country highway design procedures have in consequence been utilized within the city limits. Due to high cost of right-of-way, however, new street patterns and city widening projects are subject to handicaps.

An enormous amount of grade separation work is being carried out which is opening many arterial trafficways in cities. In Dallas there is an interesting separation project; here a trunkline highway divides into three separate main business streets of the city. Traffic is segregated into lanes leading to these streets as it approaches a three-span grade separation. An elaborate automatic control system dispatches this traffic with remarkable efficiency. Growth of the city in the vicinity of this separation is inevitable and this presents a problem for city planners to see that subdivision and zoning are duly considered. Modernized highway facilities shrink distances between places and this in turn will bring many problems and increased demand for city services in suburban areas.

Improvements in water systems have a much better chance of being made because this is a service for which a direct charge is made and revenue so obtained can be capital-

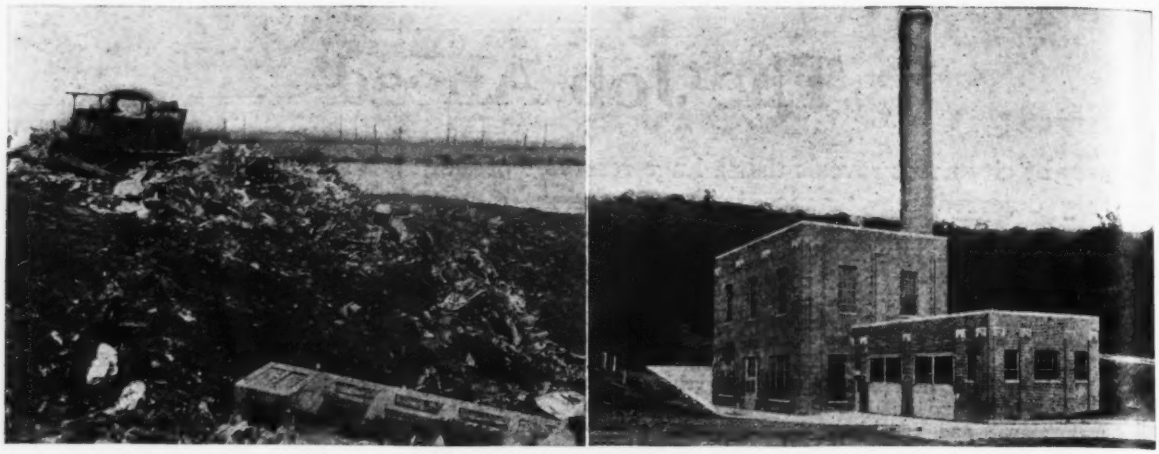


FIG. 2—WASTE DISPOSAL on dumps creates nuisances, and progressive communities are abandoning this practice. In striking contrast is the efficient refuse incinerator plant recently built at Morgantown, W. Va.; this building houses two refractory-lined basket type furnaces with a combined capacity of 80 tons per day.

ized. Growth curves for water systems have long been the engineer's constant consideration so cities are usually informed as to future needs. A water supply is such a vital personal service that funds for keeping it modern and in repair generally are easier to obtain than money for other city functions. In consequence there has been and still is an enormous amount of new work and revamping going on in practically every city in the country. Even villages of a few hundred population now are waterworks conscious if only to the extent of installing a well, a tank and a few thousand feet of pipe. The largest cities never stop adding to their facilities. New York and Los Angeles are continually expanding their systems. The lake cities are adding purification plants and the Ohio River towns are providing protection for their plants against flood hazards. Distribution superintendents, stimulated by fire underwriters to gain better ratings by installing large pipes and better equipment have, in addition, a never-ending job of waste prevention and main repairs. Automatic valve controls and similar safety devices call for heavy expenditures but their installation usually pays big dividends if such damages as accrue from water main breaks can be eliminated.

Waste disposal facilities

Betterment of sewage disposal facilities including both collection and treatment has never before been so active as recently because of the federal loan and grant process of financing. Rehabilitation has been accelerated through relief labor. New sewage plants to meet the public clamor for clean streams are being built all over the country in even the smallest communities. Refinements in methods of sewage disposal are constantly being made and wide progress has taken place in recent years. The problem of sludge disposal, which for years has baffled our best talent, is nearing solution; contributing toward this end is the use of incineration. Partial treatment schemes have been improved and adapted to many applications though non-existent a few years ago. New equipment installations in old plants such as sludge-gas engines are going into service in increasing numbers. Thus do the inventions and improvements of practice, once they are made known and become economically practical, bring about expansion of facilities.

In street cleaning and waste disposal new collection equipment is meeting the demand for more efficient operation and less nuisance. With modern closed collection trucks the hauls to transfer stations and points of disposal has become less noisome. Street cleaning statistics in many cities have shown that increased efficiency has resulted where mechanical aids have been adopted. Dumps are still dumps and create nuisances; in most cities their operation leaves much to be desired—waste disposal is still the worst handled of any municipal activity. Growth accentuates the problem. There is little hope for improvement unless great outlays are made for new equipment and better methods of disposal; money for this purpose, however, is still difficult to obtain.

Public buildings

Few city halls in large cities have adequate space to house all of the departments. Many structures are antiquated. Finances have been lacking to do more than advance ordinary upkeep and maintenance expenditures. Much relief labor has been used on these minor jobs. The time has come for a more elaborate modernization or even rebuilding of many of the tawdry main municipal buildings of the country. The same holds for many of the departmental buildings. Large rentals are paid for housing departments outside the city hall. Municipal shops and garages need re-equipping and retooling. The housing of street cleaning and garbage collection equipment in few places is no more than makeshift shelter. Many of the early sewage and water housing structures need thorough overhauling if not outright replacement.

Parks and playgrounds

Definite yardsticks have been worked out to measure acreage to be devoted to parks and playgrounds. In Omaha the Civic Improvement Council has determined needs on the basis of 10 acres per 1,500 population. The city is well supplied with large parks but needs small playgrounds and the council has spotted them over the city map to meet the above yardstick. The work of rehabilitating existing parks and making new ones is especially adapted to relief labor. Swimming pool construction in Middle West cities has had a great impetus in the last few years and still commands much attention from public works officials. As use charges can be made this type of enterprise falls in the self-liquidating class of public undertakings.

To carry out recommendations following a survey of needs requires adequate finances, good personnel and sound organization as well as the cooperation and encouragement of citizen groups. Extension of municipality relations to county, state and federal governments has brought assistance and new responsibilities. Federal help has done much in the rehabilitation program particularly in street, water, sewer and park work. This outside assistance has activated city officials on their own account

and has moved them to seek finances and adequate personnel to carry out many improvements long desired.

In Omaha, a typical Midwest city of 225,000 people, a citywide survey of needs has been made by the Civic Improvement Council which started out with a single rehabilitation purpose, that of making a park out of a cutoff lake on the Missouri River. The council has since widened its objectives, taking in every organization in the city interested in improvements. Some of the recent findings relating to growth are as follows:

Rezoning is needed. Omaha like many another city has too large an area zoned for commercial purposes. In consequence an insistent demand has sprung up for reclassification. Three main boulevards, the council finds, should be doubled in width. Eight junctures with other boulevards should be defined by plantings. Vendor stands, dumps and automobile cemeteries should be prohibited. In the future permits for filling stations should be refused. Parking places should be provided where sightly views are obtainable. Curbs and much rough pavement need repair and replacement.

Overdevelopment and slums

Omaha has a vacant lot problem induced by poor subdivision and a great many plots have been abandoned by their former owners. Rectangular subdivisions were laid out near the river where the topography is rugged. If contour development had been used this condition would have been avoided. Many cuts and fills have been made to carry streets through hills and across hollows. Although special assessments were made for improvements allegedly benefitting abutting property, in many cases the value of lots have been destroyed and as a consequence tax delinquencies have piled up. Omaha, like many other cities, has large vacant suburban areas completely paved with streets and other improvements which were provided for growth that did not materialize—owners of such lots are badly delinquent on tax payments.

On the other hand blighted areas with their full complement of services exist in Omaha within 1½ miles of the city hall. Tax contributions from these areas for many years have not paid for services rendered. A $2,000,000 federal low-cost housing project in the center of this area is counted on to start rehabilitation in adjoining areas. This 15-acre development will house 284 families where formerly there were only slum habitations. Investment houses long ago stopped taking mortgages in this area. With the government taking the lead citizens fondly hope the way will be cleared for a rehabilitation of the whole blighted district.

An analysis of the Omaha city departments to ascertain wherein works revival projects are located indicates that they are well scattered. The city chemist in the department of public affairs tests materials. His part is to secure and maintain high standards and thus increase efficiency and make expenditures go farther. The health department is closely associated with sanitation and welfare; modernization of a plumbing code was called for by the health officials following the spread of amoebic dysentery over the country. As a result, building owners and industrial concerns have eliminated cross-connections at a cost of $500,000. The accounts and finance department has made airport improvements and through its chief engineer has been responsible for the demolition of 300 unfit houses.

Briefly stated the depression effects on Omaha, (duplicated in many another city) are as follows: There has been a great reduction in assessed valuation—from a peak of $345,000,000 to a present value of $245,000,000. Revenues dropped from $2,700,000 to $2,000,000 requiring a corresponding budget cut. Nevertheless the bonded indebtedness has been reduced from $15,000,000 to $10,000,000 and one-third of the debt has been paid off during the depression! The budget is balanced and Omaha is living on current revenue.

Municipal stability has been aided by the existence of the independent Metropolitan Utilities District which provides water, gas and artificial ice. It has a good business record and is reducing rates, improving service and wiping out its financial obligations in a satisfactory manner. It has a bipartisan board of directors and a very efficient corps of engineers and executives. Some other cities boast, under similar conditions, of having utilities furnish free to the city, street lighting, water, etc., or contribute several hundred thousand dollars toward the cost of government. In Omaha there is no contribution from the utilities—on the contrary a levy of $140,000 annually is imposed on the city for hydrant rental, all of which results finally in rate benefits to the citizens and users of the utilities.

The street cleaning and maintenance department has worked zealously to maintain the streets and boulevards of Omaha in good condition. However, much remains to be done and there are many places where new base construction and replacements of pavements must be made. Before this can be done, however, methods of securing revenue and taxing the benefits must be worked out.

Omaha needs sewage treatment works and state legislation is now under consideration to place the matter in the hands of the Metropolitan Utilities District or the public improvements department of the city, headed by a civil engineer, Harry Trustin, who is essentially city engineer. To finance the work it is proposed to add the cost of building and maintaining the plant to the water service charge. It is felt that this is more equitable than a valuation tax.

The situation in Omaha regarding improvement needs and the possibilities of their fulfillment is similar to that in cities all over the country. The job ahead is a big one, but intelligently informed citizens can be depended upon for support in furthering municipal works revival if programs are logically planned and soundly financed.

FIG. 3—STREET MAINTENANCE AND REPAVING lay claim for first attention as soon as funds become available.

Focusing on Finance

What the depression revealed regarding sound and unsound municipal fiscal management and how to apply this experience in charting a safe future course of financial policy

Frederick L. Bird
Director, Municipal Research Bureau
Dun and Bradstreet, Inc., New York

THE FINANCIAL CRISIS from which American cities are emerging has been one to try the souls of the ablest public officials, but it has offered one compensating advantage. Fiscal policies evolved in pre-depression years have been subjected to the severest tests, and this experience now furnishes a guide to sounder future administration.

The fact that some cities have come through the depression with their finances in as good, if not better, condition than at its onset, while others have developed weaknesses which will take a decade, or even a generation, to overcome, can by no means be exclusively attributed to the varying impact of hard times on different cities. Many weak spots may be traced to happy-go-lucky fiscal traditions, or to slip-shod devices for meeting recent emergencies.

Present progress

The resiliency of municipal finance is being amply demonstrated at the present time. While federal and state aid in solving the fiscal problems of unemployment, as well as the easing of credit conditions, have facilitated a rapid financial recovery, most cities have made strong headway under their own motive power.

This progress is being demonstrated conspicuously by the increasing realizability of tax revenues. Whereas at the close of 1933 the average city of over 50,000 population found itself with 26.35 per cent of its year's taxes delinquent, its taxes for 1936 remained only 13.9 per cent uncollected at the close of the year—a record not far short of the fairly normal 10.15 per cent delinquency for 1930. The seven-year trend is depicted in the accompanying chart. (Fig. 1). But this year-end trend does not tell the entire story. The thawing of frozen tax assets has been proceeding apace, and in both 1935 and 1936 the average city collected total taxes, current and delinquent, slightly in excess of the current levy.

The rapid restoration of municipal financial stability, however, is not merely a product of people's increasing capacity to pay their taxes. In many cities throughout the country some of the lessons learned from the depression are being applied. Debts are being reduced, expenditures are being more rigidly controlled, budgets are being more carefully formulated and executed, and the levying and collecting of revenues are being more efficiently administered. There is no unanimity, unfortunately, in this movement for sounder financial policies and administration, but it has the advantage of strong leadership under national and state organizations of progressive public officials and civic groups, which are both studying and popularizing ideal objectives.

This development is somewhat reassuring, and reassurance is necessary in view of the accumulation of municipal fiscal problems which await solution. While the worst of the depression emergency is over, and such symptoms of acute strain as unwieldy operating deficits and outright default on obligations have largely disappeared, municipalities face a period in which there will be no let-up in the need for a higher quality of financial management than was the lot of the average city in the 1920's.

This is true for a number of reasons. While the tax base is still at or near the bottom of its long decline, emergency economies are losing their force and the pressure is growing for increased expenditures. Many of these so-called economies, in fact, were nothing but postponed costs. To the restoration of normal salaries and services must be added the cost of deferred maintenance if physical structure and equipment are to be saved from obsolescence. Federal aid (through the WPA in particular) has modified this requirement, to be sure, but has not eliminated it. To deferred maintenance must be added the costs of deferred replacements and of deferred construction of new facilities to make communities more habitable. Corollary to these items is the rising cost of material and labor. Also, unfortunately, that part of the budget devoted to welfare appears destined to remain well above pre-depression levels for some time to come. Finally, many cities have not yet paid their bills for the extravagances of the 1920's, but have added to them emergency borrowings for unemployment relief and the financing of deficits.

ABC's
OF SOUND PRACTICE

▼

A period of rising income and property valuations is the time to adopt partial pay-as-you-go policies

Borrowing policy must be determined by both the nature and extent of a city's resources

Capital requirements should be planned in order of need, not by spasmodic impulse and group pressure

Debt structure planning is just as important as controlling the debt load

Economy is lost when regular maintenance and replacement are deferred

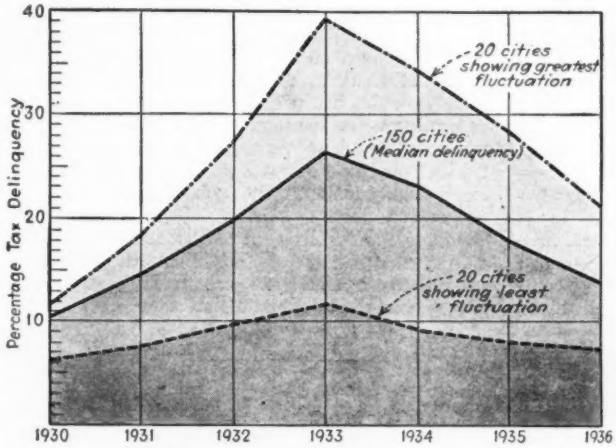
Financial soundness can be improved by: (1) better revenue collection methods; (2) adopting measures that will assure more value per dollar expended

Avoiding future disaster

Thus satisfaction over the emergence of most municipalities from the critical financial problems of the depression must be tempered somewhat by concern as to ways and means of meeting impending operating and capital requirements in such ways as to avoid vulnerability to future disaster. There is no time like the present, therefore, to take stock of what the experience of the depression has clarified regarding sound and unsound fiscal policies.

The principle which stands out most conspicuously from the experience of the past few years is that no municipality dare mortgage its future

too heavily. Most of the larger municipal bond defaults have been "cured", it is true; but in many instances the day of reckoning has merely been postponed, and resources must be centered on the payment of old debts long after the improvements that they purchased have passed into the discard. Here and there, it should be added, municipalities are still refunding large portions of their maturing bonds, their solvency thus dependent on an easy money market. A not inconsiderable number of cities became excessively indebted through loaning public credit for private real estate speculation. Some are victims of the system (or lack of system) under which several overlapping local units of government can borrow independently without regard to the cumulative effect on the community debt load. In general excessive debt may be attributed to payment on the long-term installment plan for improvements that, in a period of rising prosperity, should have been paid for from regular current income sources.



RISE AND DECLINE of tax delinquencies in representative cities showing the progress that has been made toward better collections since 1933.

Commonsense practice

The experience of the better managed cities, however, shows the complete feasibilty of developing and maintaining adequate physical structures without the exhaustion of credit reserves. It calls for no particular financial genius, but merely such commonsense practices as: (1) provision in the operating budget for routine replacements and frequently recurring types of improvements; (2) planning of capital requirements in order of need rather than spending under spasmodic impulse and group pressure; (3) borrowing for reasonably short terms and at the same time holding debt service requirements to less than 25 per cent of the normal budget and; (4) guarding against the injudicious use of special assessment bonds.

The average city, it seems fair to say, still has enough margin of economic borrowing power to justify the moderate incurring of new debt. To be specific, the average city of over 50,000 population, in 1936, had an over-all debt (including its own direct obligation and proportionate share of the debt of overlapping local governmental units) of $104.05 per capita—this bore a relation of 9.8 per cent to assessed valuation and of 7.4 per cent to estimated full value of taxable property.

While it is impossible to determine with any degree of exactitude how much debt a city may safely incur, it may be said from observation that very few cities whose over-all debts were less than 10 per cent of full taxable property valuation encountered any serious difficulty in meeting their obligations during the depression. This is not cited by way of inducement to higher debts, however, for means of financing are at hand which will leave reserve borrowing power undisturbed for emergency purposes. The normal retirement of present debt and the prospective expansion of the tax base with new building construction should provide borrowing margin without inflation of debt ratios. The liquidation of the accumulation of delinquent taxes, now in rapid progress, provides an opportunity (which a few foresighted municipalities have already taken advantage of) for a larger financing of capital requirements through the budgets of the immediate future without raising the tax levies.

Time to begin

To expect cities to scrap traditional practices over night and meet all normal capital requirements from current revenues is out of the question; however, the time to initiate the beginnings of this desirable policy is in a period of rising incomes and property valuations. Two states, New Jersey and New York, have recently made such a beginning mandatory by the requirement of "down payments" on new improvements equal to a full annual installment on the debt to be incurred, and New York City has provided in its new charter for the levying of capital purpose taxes which will advance it gradually to a pay-as-you-go basis extending over a period of years.

Two classes of cities—those emerging from the depression with excessive debts and those that have had rigid tax rate limits imposed upon them—face the future under handicaps. The former have little option in the necessity for obtaining a normal stability before another economic emergency occurs, except to incur less debt each year than they retire. The latter are largely dependent on time and disagreeable experience to demonstrate the futility of most present tax limitation devices. In not every instance, however, is the limitation as inflexible as it appears. Ohio municipalities, for example, may vote special levies both for operations and debt service, and the eleven Michigan cities that have been elected to assume the general constitutional limitation may rescind their actions. The use of revenue bonds, supported by special service charges, also offers a means of financing various types of improvements outside of tax limitations.

Debt service schedule

One further depression lesson as to borrowing policy needs practical application. The structure of a municipality's debt is second in importance only to the amount of the debt. A well arranged retirement schedule for the totality of a city's debt is a vital part of any long-range planning. Such a schedule must be without irregular peaks which might cause embarrassment in a period of depressed income, and it should provide a progressive decline, year by year, in debt service on outstanding debt in order to make room for new borrowing without raising the debt service level.

Sound borrowing and retirement policies vary for different types of cities. A city with stable, diversified resources may project a substantial level of debt service requirements well into the future with impunity; but a fair-weather city, highly dependent on a volatile industry, for example, merely courts trouble by so doing. The present debt structures of some cities of this latter type, in fact, make them likely candidates for default in the next depression. Striking evidence of the varying effect of a major economic decline on municipal income is reflected in the tax delinquency chart above, which shows the recent median peak tax delinquency for the 20 cities of over 50,000 population with the most stable records to have been 11.65 per cent, while that for the

20 cities with the least stable records was 39.05 per cent.

The quest for satisfactory new sources of municipal revenue to relieve or augment the general property tax appears to be a somewhat futile one so far as immediate needs are concerned, but recent experience has focused attention more strongly than ever before on the need for modernizing the administration of the existing tax system. The necessity for more competence and uniformity in property assessment has been stressed by the collapse, in some cities, of inflated valuations; by the discovery, in others, of greatly undervalued property; and by the justifiable dissatisfaction of many taxpayers. It is being demonstrated, moreover, that, given businesslike methods, taxes can be collected more promptly and completely. For example, in 1936, 46 of 150 large cities collected higher percentages of their tax levies for the year than they did in 1930—a result primarily attributable to better collection methods. The saving in interest costs alone, through the lowering of short-term borrowing requirements, is by no means a negligible item.

Getting your money's worth

Finally, as a means of meeting the multifold demands on post-depression budgets, cities are under the necessity of getting more for their money. How this can be done through the centralized purchase of materials is being exemplified brilliantly by such experts as commissioners Forbes of New York and Nicholson of Milwaukee. Cost accounting and the establishment of unit cost standards are making progress in the administration of public works and mean additional opportunities for cities to get fullest value.

Those aspects of planning which deal with the most efficient fitting of structure and design to desired functions and purposes offer partially unexplored opportunities to technicians in local government. Combined with the broad scope for savings through more scientific methods of purchasing, cost accounting, land acquisition, and functional planning, is the fact that money costs less at the present time than for any important borrowing period in municipal financial history. Municipalities that are able to show, by adequate financial reporting, that their fiscal management is sound and their borrowing policies conservative, are in a position to secure credit for all reasonable and necessary purposes today at rates that are a definite contribution to lower capital costs.

Some Hints on Improving Municipal Financial Practice

HALF the financial headaches of cities are caused by poor budgeting and haphazard bookkeeping, say finance authorities. The remedy lies primarily in consideration of all parts of the accounting and financial procedure in their relations to one another to determine whether practices now employed are entirely adequate and satisfactory.

To make it easy for cities to measure their present procedures, a special committee on accounting of the Municipal Finance Officers' Association has just completed a pamphlet, "Standard Practice in Municipal Accounting and Financial Procedure." In it are assembled the recognized principles of sound accounting procedure and financial administration. The three important elements concerned are: accounting and internal audit control; the collection, disbursement and custody of municipal funds; and post-auditing.

Budget-making

Cities err in their budget-making, the pamphlet points out, if they do not make their fiscal year and the budget year coincide. Fiscal and budget years should be planned so that revenues for financing operations will become available immediately after the beginning of the fiscal year. In estimating revenues and expenditures for the budget year, account should be taken of past revenues and expenditures, and allowance made for any changes in operating policies or in other conditions likely to affect either revenues or expenditures, such as unexpected losses in uncollectable taxes.

An air-tight accounting system is necessary to exercise budgetary control, without which the best prepared budget is of little use, the pamphlet points out. This means that the chief executive, the chief financial officer and the heads of the various municipal departments must cooperate actively. If also requires accounting records that show complete financial information promptly. Cost accounting, which provides for recording all elements of cost incurred in carrying on a municipal operation or completing a specific job, is recommended as a basis for budgeting and expenditure control.

Financial reports important

The importance of financial reports is stressed. These include the internal reports that are prepared (advisedly once a month) for administrative officials as a guide in controlling and directing the general operations of the municipality, and the annual financial report, which should be prepared promptly at the close of the fiscal year for use by administrative officials, legislative bodies, and the public.

Advice is given on the post-audit, or external audit, made for the purpose of verifying the financial condition of the municipality at the close of the fiscal year, and to check for legal or technical errors. This audit may be made either by a municipal department, by independent private accountants, or by some state agency, says the pamphlet, but certain procedures should be followed whatever the case. In engaging auditing services cities are recommended to give primary consideration to the qualifications of the auditor, and not award the audit contract on a competitive bid basis. There should be a clear understanding with the auditors via written contract as to the persons to whom the auditor is responsible, the kind of audit, the assistance the municipality is to furnish, when the audit is to be finished, etc., and the city should insist on an auditing procedure as outlined by the National Committee of Municipal Accounting.

American Cities Today

THE coming of age of American cities and the emergence of their new public relationship with state and national governments is the theme of *The Municipal Year Book 1937* a resume of city activities and statistical data, recently published by the International City Managers' Association.

As pointed out in the lead article by C. A. Dykstra, former city manager of Cincinnati and newly chosen president of the University of Wisconsin, half the nation's population lives either in, or in the shadow of cities of 100,000 or over. Five of these cities provide homes for more than 14,000,000 persons, and the growing importance of American cities is also found in the number of units concerned, a total of 3,165.

Mr. Dykstra finds this as "the great revolution in the United States, a vital change in the way of living and in the making of a living; a changed character in our national life. He states that 40 per cent of the American people live in 96 metropolitan centers which occupy slightly more than one per cent of the land area of the nation.

● PRACTICE AND PLANNING

Building to a Program

How to set up a long range plan of municipal improvements which takes into account the financial expediency of projects as well as the selection and sequence of new undertakings

Joseph P. Schwada,
City Engineer,
Milwaukee, Wis.

AN IMPORTANT LESSON has been learned regarding municipal public works planning and financing as a result of the depression. Numerous examples have revealed that the underlying cause for default on obligations, unfair tax distribution and unwieldy debt burdens can be attributed to common practice in the past that tolerated random selection of improvements, (or permitted special interests to dominate their selection) without proper regard to their financial expediency or relation to future needs. The moral is, build to a program.

Building to a program means that all physical improvements undertaken by a municipality should be planned ahead for a definite number of years. Such a program is based on a predetermined financial set-up to avoid the creation of an unbalanced tax load. It should display each project of construction and maintenance in terms of estimated cost, allocating priorities to improvements in the order of their urgency. The program should also suggest the means by which funds are to be secured. By this advance listing of improvements and methods for financing them a municipality avoids illogical public works construction and financial difficulties.

Analyze spending habits

Of first importance in the establishment of a comprehensive building program is an analysis of the financial condition and resources of a municipality. The number and type of improvements that can be undertaken depends, of course, upon the amount of money that will be available for that purpose. It is therefore advisable that a careful and thorough study of past revenues and expenditures be made. When this is done certain important facts which influence a program will stand out. Where a municipality has been continuously increasing expenditures for permanent improvements and financing a substantial part of these by bonds, it will be noted that for a time more improvements are obtained each year than the annual cash and debt service appropriation for such improvements. But since the debt cannot be increased indefinitely, the time comes when annual costs loom larger than the annual investment. Obligations must then be paid and fewer public improvements can be obtained.

"Building to a program means that all physical improvements undertaken by a municipality should be planned ahead for a definite number of years. Such a program is based on a predetermined financial set-up to avoid the creation of an unbalanced tax load. It should display each project of construction and maintenance in terms of estimated cost, allocating priorities to improvements in the order of their urgency. The program should also suggest the means by which funds are to be secured. By this advance listing of improvements and methods for financing them a municipality avoids illogical public works construction and financial difficulties."

It will also be found that due to financing by bonds, the cost of improvements is greatly increased and this ultimately means fewer improvements. These facts should be recognized in setting up a program and corrective measures should be applied with the idea of getting out of debt as soon as possible and financing new operations on a cash basis.

As proof that municipal debt can be eliminated, and to illustrate the advantages of a sound financial policy in building public improvements, attention is called to the situation in Milwaukee. This city never defaulted on debt payments. Throughout the years of the depression all bond obligations were promptly met; from 1930 to 1936 bondholders received $41,528,239, of which $26,919,316 represented payments on the principal.

The reasons for this good record are found in the financial program that the city has followed since 1911 when a statute was enacted that wiped out the previous custom of issuing bonds for the city's share of the cost of street pavements, and substituted a 1-mill tax assessment for this purpose. Within this limit Milwaukee has made itself one of the best paved cities in the United States. The practice of meeting a share of the cost of permanent capital construction in cash appropriation by gradually increasing amounts was also adopted in 1911. This practice has been consistently maintained with a tax rate that is seldom above, and usually below the average in American cities.

From 1920 to 1929, when the area of the city was increased from about 26 to 42 sq.mi., the cost of permanent improvements totaled $105,177,351, less than half of which (actually $47,577,398) was financed with borrowed funds. In the period 1913 to 1932 inclusive, the city undertook permanent improvements costing $140,542,461 of which only $71,879,440 was financed with bonds.

Since 1932 the city has issued no bonds for non-revenue-earning purposes. In addition, about $18,000,000 of its public debt has been retired and the city is now looking forward to the day when all public debt will be eliminated. A public debt amortization fund created under a mandatory statute by the state legislature in 1923 is aiding the realization of this objective.

Prior to 1923 the city had in its treasury surplus cash for the transaction of its business. At tax paying periods large amounts of cash were received for which there was no im-

mediate use; money was also on hand as a result of bond sales. Up to 1918 these funds were deposited in bank checking accounts (bringing a low rate of interest) and withdrawn as needed.

At the time of the World War the city realized that it could receive a larger return on its available cash from sources other than the banks and thereupon obtained the passage of a statute permitting it to purchase federal and municipal notes and bonds. From 1918 to 1931, inclusive the interest and premimums earned on U.S. bonds amounted to $2,663,994.

The problem then arose what to do with this added interest income. Was it to be used as revenue to defray operating expenses and thus reduce the tax levy, or was it to be used, in part at least, to apply on the public debt? After a careful study, a plan was devised by which all of the interest on deferred special paving assessments was paid into a separate amortization fund together with one-third of all other interests earned by the city. This was invested and reinvested in securities of the United States and of municipalities in Wisconsin.

The statute permitting the above procedure was amended in 1933 to permit disposal of the bonds and reinvestment of the proceeds in delinquent tax certificates yielding a return of about 10 per cent; as a result the amortization fund is growing more rapidly than was at first anticipated. The public debt amortization fund in 1936 totaled $6,287,140 and if the present rate of growth of the fund and the decline of bonded debt continues, the amortization fund will equal the entire debt of the city by 1943. When that time comes it will no longer be necessary for the city to levy a tax for interest and sinking fund payments since the earnings from the amortization fund will pay for the debt as serial bonds mature. Milwaukee will then be in a position to finance all permanent improvements on a cash basis, without paying 50 cents on interest for every dollar's worth of improvements.

General principles

Coming back now to the general principles of establishing a long range building program, let us first consider how an estimate can be made of future available funds. This can best be done by first determining what the tax rate per unit of assessed valuation has been in the past to support the debt service and any additional appropriation for permanent improvements; then an estimate should be made of the future sums that will become available for the same purposes. The latter is based upon an assumed tax rate and an estimate of the future valuations of the city. The total estimated expenditures so obtained must be divided between the fixed obligations on debt and the annual necessity for acquisition and construction; in addition, to the amounts thus obtained should be added the special assessments to be selected for the improvements. This will give the total sum to be expended.

It should be emphasized, however, that the financial affairs of a municipality and the physical inauguration of improvement projects are closely related elements and cannot be separately considered. They should be treated jointly as integral parts of a complete program. Therefore, while projects selected for the current year are definite, the improvements allocated to specific years in the future are open to revision once each year when the new budget is made. Priorities can and should be established, but they must be adaptable to modification when such a policy is desirable.

Benefits from a program

But what benefits will be obtained by building to a comprehensive program? For the taxpayer it provides a check against the building of expensive projects having small community value, and prevents the construction of projects unreasonably demanded by special interest groups. Furthermore, taxpayers are entitled to evaluate contemplated improvements; this opportunity can best be provided by setting up a list of projects for a period of years with complete estimates of both construction and maintenance costs. With such knowledge both the taxpayers and city administrative officials have an opportunity to foresee and pass better judgment upon improvements before they are constructed.

There are many other obvious advantages to be obtained from building to a long-term program. For instance, under such an arrangement projects can be planned more deliberately with sufficient time for adequate study of the facts involved and the relative merits of alternative schemes. Detailed plans and specifications can also be prepared for approved projects and held in readiness for the letting of contracts at an opportune time. In addition, sites can frequently be acquired at low cost and oftentimes certain preliminary parts of the project can be done in conjunction with other improvements at a considerable saving of money. Then, too, a better qualified and permanent engineering organization can be maintained to plan and construct new work. This whole procedure is certain to produce better results at less cost than hurriedly conceived projects usually resorted to when popular enthusiasm instead of judgment carries the day.

Building to a program aids both the owners of property and the municipality. It not only prevents the building of private structures that would increase the cost of public improvements, but also enables property owners to make changes and improvements to fit in with a master plan. This helps in the leasing of property since tax and special assessment demands and the benefits accruing from improvements can be more definitely anticipated.

Most municipalities must contend with private organizations who too often lose sight of the many factors involved in financing a sound works program and demand the construction of projects that may benefit individual localities but not the community as a whole in proportion to the costs involved. Oftentimes improvements are demanded ahead of schedule. The pressure that is brought to bear upon officials in such instances can best be withstood by means of a long-term program backed by public opinion.

In a growing community, land is periodically annexed and extensive public improvements must then be installed. A long-range program is of advantage here because it considers the trend of expansion and serves to guide future development. Necessary improvements can be more rationally planned, therefore, and extended to undeveloped areas without undue cost to the taxpayer and only as growth justifies the outlay.

Some other advantages

And finally, building to a program helps to prevent a newly elected administration from postponing necessary maintenance which, if left for later years, throws an excessive burden of expenditures on succeeding administrations. Besides, deferred maintenance also reduces the life of structures and increases their ultimate cost; bridges and viaducts must be painted and repaired at definite intervals and equipment used beyond its useful life is poor economy. Again, pavements that are repaired when they should be completely replaced create final costs far in excess of what they should be.

These, then, are some of the benefits that can be obtained by making public improvements in conformity with a long-range program. The extent of the benefits will depend, of course, upon the thoroughness, enthusiasm and fairness with which the program is carried on. One thing is fundamental if success is to be achieved—the financial phase of a program must be planned and executed with the same care and integrity that is given to the engineering details. Only by such an approach to unsuccessful public-work construction can a city hope to achieve sound and rational development.

New Streets for Old

Present day traffic and pedestrian safety requirements call for revisions of practice in street layout, pavement selection, intersection design and thoroughfare illumination

George B. Sowers and Malcolm S. Douglas
Consulting Engineer and Asst. Prof. Case School of Applied Science, Respectively, Cleveland, Ohio

STREET LAYOUTS and paving in our municipalities offer a real challenge to the ingenuity and vision of the municipal engineer. The life and industry of great cities depends upon the advantageous and economical planning of streets and pavements. The engineer is also faced with the fact that 80 per cent of the accidents in our streets are caused by collisions of pedestrians and automobiles. Therefore the details of street construction must be chosen not only for economy but to promote safety.

The fundamental purpose of streets is to expedite the movement of vehicles and people. But in planning the location of thoroughfares the stubbornness or irritableness of the human family must be taken into consideration. Streets may be painstakingly designed to move traffic from one location to another by the shortest and most direct route and still not be used as much as the plan warrants. The modern driver prefers to move at a higher rate of speed, without delays, over some longer route than to follow a shorter route over thoroughfares that may be carrying street cars or slow moving vehicles.

Factors governing design

Streets must be planned to move traffic as speedily as possible with the highest degree of safety to everyone. The street problems of small municipalities are similar to those of the larger metropolitan districts, although their traffic will consist of a greater proportion of through traffic and a smaller part of local movements. The engineer in small cities is confronted with the development of a street layout that will move traffic through the city without unnecessary interference from local trade and traffic. Bypass routes around small cities may prove to be ineffectual since filling stations and stores rapidly spring up along the new route. These create new centers of congestion and transplant the street department's traffic problems.

In looking forward to the future requirements of streets the city engineer must study the growth trends of his community and evolve a rational plan by working hand in hand with the city planners who are trying to shape the future development of the municipality. The tendency in the past has been toward conversion of older residential sections into industrial and business centers, and the development of new residential districts in the suburbs. It is the function of the municipal engineer, therefore, to plan facilities for the commuters and service vehicles to reach these newer districts and to replace the streets and pavements to serve the older portions of the central area better. Street layouts in too many instances have been planned to make our cities better places to leave rather than better places in which to live.

Re-servicing old areas

Arterial through highways have been and will continue to be constructed to facilitate the movement of traffic between suburban districts and the center of the metropolitan area but city planners are fairly well agreed that the constant pushing out of residential districts will reach an economical limit. The older residential areas within the heart of the city must, of necessity, be rehabilitated, and districts reestablished as residential or housing areas near the center of business and industry. Such a movement presents to the engineer the necessity for relocation and repaving of streets in the new housing area and the planning of streets leading from these areas to thoroughfares accessible to industrial and recreational centers.

The street layouts within the residential area will need to be planned so that people living within rather limited boundaries will be able to reach stores, theaters and schools without encountering the fast-moving and voluminous traffic of main highways. The community plan should be so complete that ordinary living and recreation can be carried on without the use of motor vehicles. Within these areas the problems of street planning are identical with those of any small community. These centers would be located adjacent to thoroughfares carrying various forms of public transportation used by the residents in going to and from their daily business. Well-planned housing areas will make our cities as desirable as the suburbs and reduce the great volume of vehicle movements now caused largely by commuters.

City traffic separates itself into local and through traffic. Automobiles of local residents, delivery trucks and public transportation vehicles constitute the bulk of local traffic. Through traffic is made up of trucks, buses and automobiles travelling from the industrial and business centers through the metropolitan area to outlying districts. A third division is inter-city traffic while this has an important influence on street construction in small and medium sizes municipalities, it is a negligible factor in large city transportation problems. Local traffic is largely confined to a central district which should be provided with adequate streets and main thoroughfares interlocking the business, housing and recreational facilities of the area. Since much of the through traffic is made up of the heavier and slower moving vehicles it must be provided for with heavily constructed pavements uniting industrial districts and neighboring communities.

Skid-proof pavements needed

The modern automobile has given the planning engineer his greatest problem. It has been difficult if not impossible for the engineer to keep abreast of the rapid advance made in motor vehicle improvements. A few years ago the automobile required only an ample width of smooth pavement over which it could move at a moderate speed. The modern motor vehicle with its greater acceleration, quick deceleration and faster average speed presents entirely different problems so far as paving is concerned. Street surfaces can no longer be made smooth but must purposely be roughened to increase the friction between the tire and the pavement; this reduces the tendency to skid sidewise and gears the tire to the road when accelerating or stopping the vehicle. Smooth surfaces were necessary when hard tires were used but the modern pneumatic and balloon tires aid in smoothing out the effect of the irregular pavement.

The recently developed de-aerated vertical fiber paving brick, the practice of removing surplus bituminous filler from the surface of brick pavements, the "sandpaper" finish on concrete

streets, and the "open type" of the bituminous paving construction are examples of pavement types being developed to aid in reducing skidding of the wheels on the surface. It is found that the modern automobile with its longer springs, knee action and shock absorbers will give its occupant a comfortable ride over a pavement that is quite rough. Though it is no longer desirable to construct smooth pavement surfaces the general profile of the road must be smooth and without humps or depressions.

The pavement of the future will have a flatter crown, permitting intersections to be designed with all portions usable so that it can be traversed in all directions without discomfort when travelling at normal speeds. Considerable attention is being given to the design of stormwater inlets to eliminate depressions in the road, as they are a hindrance to safe driving and reduce effective roadway width. In St. Louis, for example, a creditable system of open curb inlets has been developed for removing storm water from the streets. (See *ENR* Feb. 11, 1937, p. 228).

During the depression years cities and street railway companies were forced to deviate from their standard types of paving and track construction. As a result, new and more economical designs are being developed. It is generally agreed that the track area of a street must be equally usable to both the motor vehicle and the trolley car. An even contour across the tracks with a surface having the same traction characteristics as the balance of the roadway paving is recognized as most desirable from the standpoint of safety and usefulness.

Roughened concrete pavements in which the rails and ties are firmly embedded, such as that used in Cleveland, offers an excellent pavement surface combined with a rigid, water-tight track construction. Where the roadway is of sheet asphalt the concrete surface is depressed in the track area and a thin asphalt top is laid over the concrete; in a brick-paved roadway thin vertical-fiber bricks are laid in the depression. In all cases, however, an even surface contour extends from curb to curb and a pavement with uniform traction characteristics over the entire roadway is achieved.

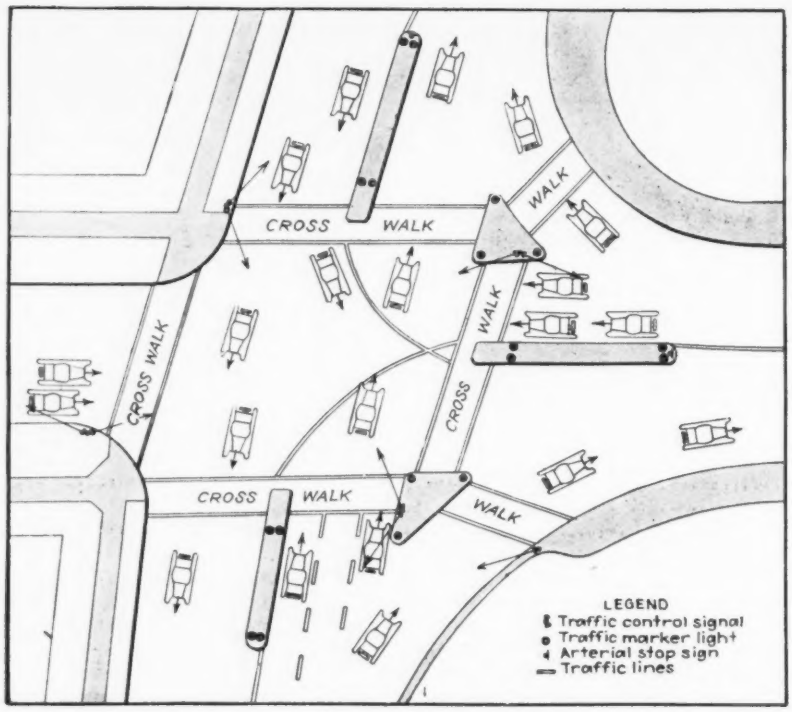


FIG. 1—CHANNELIZED INTERSECTION used in Milwaukee. This design facilitates traffic movements and provides protection for the pedestrians who need to watch in only one direction for oncoming vehicles.

Intersection design

Design of street intersections is an important part of street planning. Much loss of life and property damage can be attributed to the hazards created by intersections. A properly designed street intersection is based on the scientific study of the traffic load. Motor vehicles can be directed into lanes or channels each of which is adequately and independently controlled; to facilitate the traffic flowing around corner curves should be used with large sweeping radii. Traffic making right turns should be placed in its own channel and regulated by signal devices synchronized with signals directing other lanes of traffic.

The pedestrian must also be considered in the design of the intersection. Raised safety islands may be provided in the pedestrian crosswalks to facilitate safe crossing of wide streets. The islands should be so placed and the traffic so channelized that a pedestrian crossing between curbs and islands within the street will not only be governed by signals, but will be required to observe the traffic coming from one direction only. The safety island should be conspicuously marked, preferably with low amber-colored lights to warn the motorist of an obstacle and a point of danger.

An excellent example of a traffic intersection that was scientifically designed, is that at North Prospect Ave. and East Mason St., Milwaukee, Wis. It has been in operation since 1930. (Fig. 1). This intersection guides the motorist into independently controlled channels and allows maximum movement of traffic in all directions. The curb and islands are streamlined with long sweeping radii. Safety islands and crosswalks are advantageously placed for the safe crossing of the pedestrian.

Illuminating facts

Carefully planned street markings and intersection designs will fall far short of their usefulness unless they are properly illuminated at night. Illumination has been found to be one of the most important elements in accident prevention. Many cities, in curtailing street lighting expenditures during the depression, found that the traffic accident rate increased materially. Experience has proven that properly designed street illumination is far more economical than the cost of accidents and injuries.

The problems of headlight glare, reflection from pavements, desirable height of the general illumination, etc., are subjects of current research. It has been found that mountings for street lighting should be high, thus reducing glare; that glassware should be selected that will spread the greatest possible amount of light evenly over the pavement. It has not been uncommon in lighting schemes of the past to find that 60 per cent of the light was wasted in illuminating the sky.

Street lighting should be intensified at locations where safety islands are placed and at crossings used frequently

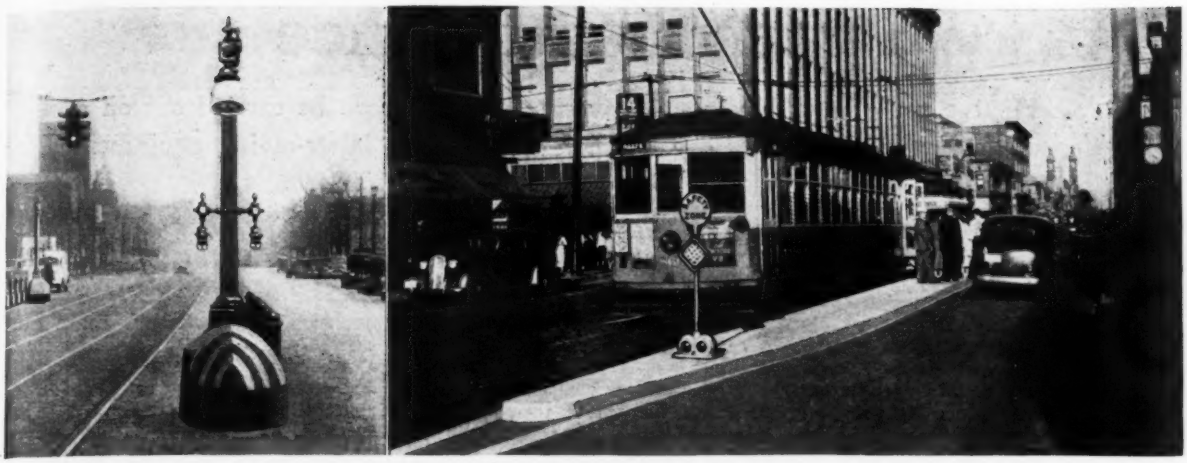


FIG. 2—SAFETY ISLAND construction contrasted; at the left is the massive obstruction type which will direct vehicles into the lane or stop them. At the right is the bumperless raised type—streamlined and provided with a light standard on springs, it offers small hazard to the vehicle.

by pedestrians. Intensifying the lighting makes the safety island as well as all objects in the general vicinity more visible. Increasing the intensity of general illumination at an intersection has the effect of neutralizing the glare of headlights and will increase the visibility of background objects. Concentration of light on the safety zones alone, however, produces the effect of a screen and makes distant objects indistinct. General street lighting should provide uniform illumination as safety is impaired by alternating zones of extremely dark and brightly lighted areas. There is a relation between traffic density, illumination and accidents, and consequently light must be proportioned to traffic volume.

Light-reflecting properties of pavement surfaces must be given careful consideration when designing a pavement for a specific location. Visibility under street lighting is dependent upon the brightness of the pavement surface. Sheet asphalt possesses the greatest brightness when the viewed roadway lies between the observer and the source of light, but the brightness is confined to a strip only a little wider than the light source. An object not in this strip of brightness will not be seen. Bituminous macadam reflects a circle of brightness directly below the light and large capacity lamps are necessary to give proper night visibility on such streets. Concrete disperses light in all directions and has the property of making the entire width of the pavement the background instead of a small strip of brightness as in the case of asphalt pavements. Concrete also reflects light more than other types of pavements, and consequently good visibility can be obtained with a relatively small source of light.

Heat reflection may be an equally vital factor in the choice of pavements for a particular location and a dark pavement surface, such as an asphalt or brick, having lower light reflection ability may be the most desirable since they reflect less heat. It is doubtful if pavements are ever chosen solely for their light or heat reflecting properties but this detail cannot be entirely neglected in paving design.

Safety islands

The rapid movement of traffic is a constant source of danger to people waiting to board street cars and buses. Important street intersections should therefore be provided with safety zones or islands, designed to direct vehicles and guard pedestrians without hazard to either. Of two general schools of thought regarding safety zones, one would protect the pedestrian by massive and rigid obstructions and the other by bumperless raised safety islands. The first of these places a hazard in the street which is intended to direct the motorist into his traffic lane or stop him; frequently this is the cause of serious accidents. Occupants of vehicles have been killed by colliding with the rigid structures and pedestrians have been crushed between the vehicle and the "safety" obstruction.

The bumperless type of raised safety island on the other hand is designed to guide the vehicles around the area set aside for pedestrians without raising hazards for the vehicle. These islands are usually streamlined to conform to the flow of traffic. In many instances there is a considerable space between the point of the island and "Safety Zone" standard and light which is provided to deflect vehicles and prevent them from reaching pedestrians standing in the safety zone. The two contrasting types of pedestrian safety zones are well illustrated by the latest design of the massive and rigid obstruction type being built in Cleveland, and the bumperless type of safety island built in Milwaukee.

Each community offers its engineer peculiar and specific problems in street design, the adequate solution of which will tax the ingenuity of the designer. Details of construction satisfactory in one area may be wholly inadequate and unsuited if copied in other locations. Street layout must be planned to facilitate the free movement of traffic with the highest degree of safety to both vehicles and pedestrians and at the same time not interfere with other necessary uses of thoroughfares. The municipal engineer of today having at his command a variety of new materials, new construction equipment and the results of research in safety and traffic habits is obligated to the public and his profession to plan street layouts and paving economically and wisely.

Traffic Line Marking Experiments

THE city engineer of Los Angeles has substituted a wavy white center traffic marking as a danger warning at intersection approaches, in place of the conventional painted center stripe, according to the American Public Works Association *News-Letter*. Mixed with the white paint are glass beads, 1/20-thousandths of an inch in diameter, which increases its effectiveness at night.

The *News-Letter* also stated that the Indiana State Highway Commission is installing four types of center traffic line marking, covering one mile each, on a section of four-lane highway. This experiment is an attempt to divide the 40-ft. roadway into two 20-ft. roadways, separating opposing traffic. The four types are: (1) cat-eye reflectors; (2) short transverse corrugated metal strips which give a bumping sensation as a vehicle passes over them; (3) low half moon-shaped strips of corrugated mental also designed to cause bumping, and (4) a low rounded concrete curve.

Street Maintenance

An effective program of street and sewer maintenance can be carried out on a limited budget with efficient organization and modern labor-saving equipment

William B. Shafer
Superintendent, Bureau of Highways and Sewers, Pittsburgh, Pa.

CITY STREETS were grossly neglected during the depression because of limited funds and, as a result, municipal engineers today are faced with a big program of street repair and deferred maintenance operations. But budget allowances have not yet been restored to required quotas and in order to carry out this work effectively it will be necessary to compensate for financial deficiencies. The only possible way to accomplish this is to discard obsolete methods, improve organization and personnel efficiency and utilize modern labor-saving equipment. These principles have been adopted in Pittsburgh as a basis for improving street maintenance functions.

Conditions in this city are typical to those existing elsewhere. For instance, only 22 mi. of streets have been repaved in the last 5 years as compared with 99 mi. completed in the previous similar period; and budget allowances for maintenance work have been cut to one-half the amount of what they were previously.

Pittsburgh with its population of 670,000 covers an area of 56.4 sq.mi. and an extensive maintenance program is required. The city has 1,350 mi. of streets (870 mi. of which are paved), 40 mi. of concrete and wooden walks and steps, sanitary and storm sewers totalling 950 mi. in length, and 20,000 catch basins.

Maintenance organization

The city is really a collection of individual communities separated by hills, valleys and rivers. Due to this rugged topography maintenance problems are somewhat more difficult than those of the average American city. In order to carry on effective maintenance work the city has been divided into six divisions, with division headquarters strategically located to facilitate the distribution of labor, material and supervision. Each division is subdivided into districts in charge of competent foremen. Where districts are far removed from headquarters, substations have been established for the storage of tools and minor supplies. The cleaning and repair of streets, sewers and walks in each division is under the responsibility of a supervisor. Resurfacing of asphalt pavements and crack sealing of concrete pavements is handled by a central department that serves all divisions.

When utility companies tear up pavement they make their own restorations under agreement with the city. This work is under the supervision of the Division of Public Utilities which issues permits and collects fees for work carried on by utilities or private individuals affecting city streets. One of the most important activities of the division engineer of public utilities is his connection with the Pittsburgh Public Service Coordination Committee. Every utility company in the metropolitan area is represented on this committee. Meetings are held at regular intervals, at which time any program of improvement or reconstruction proposed by the city is reported, so that the utilities can make repairs or alterations to their underground service before work is started. Both the city and the utility concerns have benefited from this arrangement.

Reports and records

Daily reports are submitted to the main office of the maintenance bureau, outlining the amount of work done during the preceding day and the expenditures for labor and material. A monthly statement is compiled showing unit costs for all operations. These unit figures are plotted on a chart so that comparisons can quickly be made with previous costs.

The system used for keeping costs is based on recommendations made by the National Committee on Street Pavement Economics. These include: (1) the cost of actual maintenance work performed reduced to square yards of surface actually repaired; and (2) the maintenance cost for an entire paving improvement, reduced to a unit cost per sq.yd. With these data it is possible to determine: (1) the current year's cost per sq.yd.; (2) accumulated maintenance cost per sq.yd. to date to be determined; and (3) average annual unit cost per sq.yd. to date to be determined. Such information makes it possible to ascertain accurately when it is time to replace pavement rather than to continue maintenance.

The importance of a consistent program of street maintenance cannot be overestimated. A dollar spent on maintenance, if spent in time, will often save hundreds of dollars in premature new construction. Delayed repairs to raveled pavements, pot holes, etc., may allow damage to reach the point where extensive reconstruction is required. Periodical inspections, therefore, are an essential part of a maintenance program and needed repairs should be promptly made. Special efforts should be taken to make patches as good as the original surface and when possible of the same material as in the pavement.

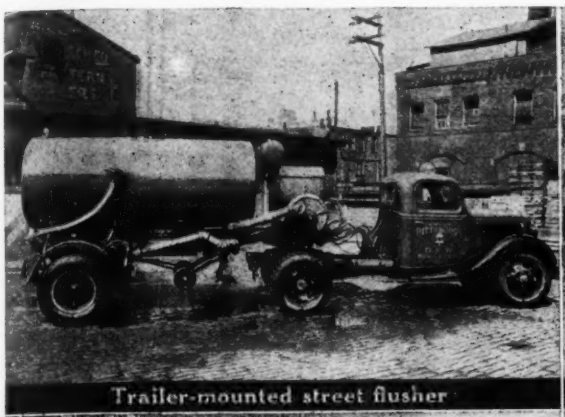
In Pittsburgh, as in other cities before the days of heavy automobile traffic, brick or blockstone pavements were laid on flexible bases. Under present conditions, however, these pavements become very rough and require repaving or resurfacing. In cases where the base is manifestly too weak to stand traffic the street should be entirely reconstructed. The salvaged materials can generally be used on other streets of less importance where brick or blockstone can be relaid on an existing base. If there is little salvage value in the surface materials, resurfacing of the whole pavement with a bituminous material usually gives satisfactory results. The average cost for resurfacing 100,000 sq.yd. of old blockstone pavement in Pittsburgh varied from $1.00 to $1.25 per sq.yd.; maintenance costs on these pavements over the past ten years averaged about ½ cent per sq.yd. annually.

Care of dirt streets

The satisfactory maintenance of dirt streets is one of our major problems. With 480 mi. of such streets, lying mostly on steep hillsides with grades up to 25 per cent, the aggregate cost of keeping them in proper condition for traffic is a big item. Besides, the constant wash from dirt streets on paved streets and into catch basins increases the cost of street and sewer cleaning. The logical solution of this problem is to surface these streets with low cost pavements and improve drainage conditions as fast as funds are available.

Unfortunately, in the state of Pennsylvania the laws are such that property can be assessed only once for

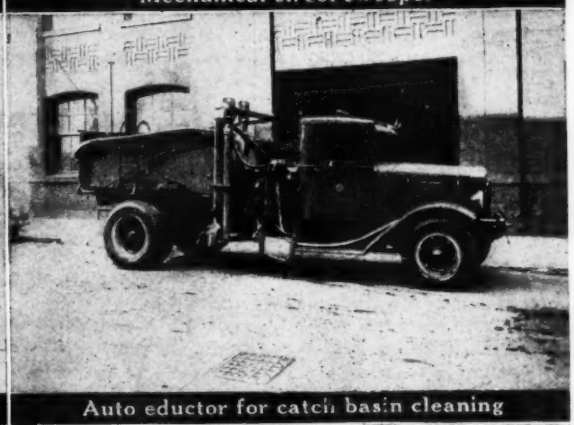
MAINTENANCE EQUIPMENT USED IN PITTSBURGH



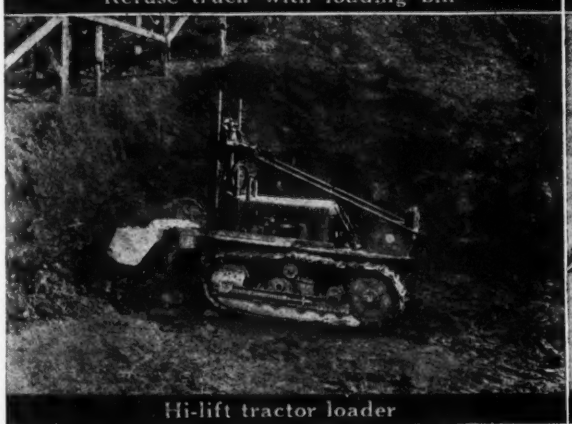
Trailer-mounted street flusher

Mechanical street sweeper

Refuse truck with loading bin

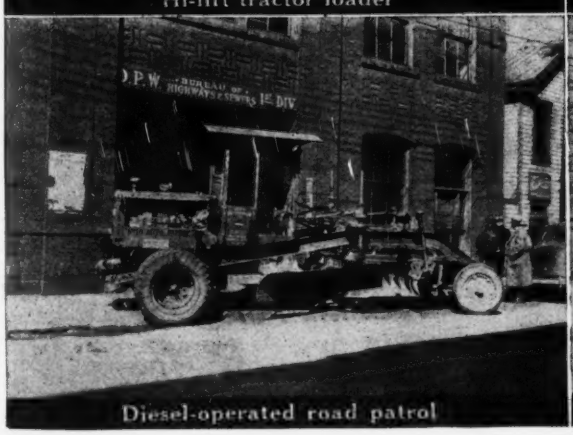


Auto eductor for catch basin cleaning



Hi-lift tractor loader

Trailer dump truck



Diesel-operated road patrol

Snow loader

HILLSIDE street improvement, typical of the dirt street improvements made by the Pittsburgh bureau of maintenance.

street or road improvements. Therefore, in order to reserve the right to assess the property later on for a permanent improvement the city is obliged to make temporary improvements at its own expense. A bill has been presented in the legislature to amend present laws so that property owners may be assessed for a semi-permanent improvement and later for a permanent improvement; if this is passed many of our dirt streets will be immediately improved on this basis.

For the maintenance of dirt streets where traffic is light, a motor patrol equipped with scarifying teeth has proved to be a most effective piece of equipment. After streets are shaped they are surfaced with a light cover of air-cooled slag and treated with an asphalt dust layer. Under traffic and with occasional reblading the surface becomes relatively smooth and hard and more or less moisture-proof. After a few years of such treatment the road surface affords a good base for a more substantial surfacing with premixed or retreated bituminous material.

Under the present unemployment relief program, Pittsburgh is improving 50 mi. of dirt streets with 5-in. compacted air-cooled crushed slag base, surfaced with 2-in. premixed asphalt top. The material used in the base varies in size from $\frac{3}{4}$ in. to $2\frac{1}{2}$ in. and is choked with a finer material, varying from dust to $\frac{1}{2}$ in.; the surface course material varies from $\frac{3}{8}$ to $1\frac{1}{2}$ in. After the top is laid and thoroughly compacted a final seal coat is applied. During the winter months, an inverted asphalt emulsion instead of the regular water emulsion or cut-back has been used with satisfactory results. On steep grades with heavy traffic, the base is penetrated before surfacing.

Mechanical equipment can be used to good advantage in carrying out an economical maintenance program. In our work at Pittsburgh we have found that a high-lift tractor shovel with bulldozer attachment is a very useful tool for light grading, preparing subgrades, removing slides and ditching. On heavy grading or hard excavation, a quick-acting $\frac{1}{2}$ yd. gasoline shovel equipped with dipper stick or clamshell rig is indispensable. This machine is also used as a crane for handling cribbing and heavy materials.

About 50 per cent of our city streets are cleaned with mechanical sweepers and flushers. The remainder are cleaned by machine flushing and patrolmen or bull gangs. In order to increase the mileage of streets cleaned by mechanical sweepers, all the machines have recently been equipped with pneumatic tires and they are to be operated on a double shift for a total of 16 hours a day. In 1936 the cost of cleaning streets with machines (including the disposal of street sweepings by pick-up trucks) averaged about $2 per curb mile.

Snow removal

To cope properly with snow removal each of the six divisions is provided with two heavy plows mounted on heavy duty trucks which supplement regular motor graders and bulldozer equipment. In business districts where snow has to be removed promptly, a snow loader is used. Snow is disposed of by dumping into the main sewers or on vacant lots.

The cindering of icy streets is a major function of the street maintenance department because of the steep grades on many thoroughfares. When icy conditions prevail, cindering crews are dispatched on a prearranged schedule to cover all important streets and intersections. After these are cindered secondary streets and special complaints are taken care of. Cinders mixed with calcium chloride or rock salt are stored in stock piles at strategic points around the city.

The most sanitary method of cleaning catch basins is by means of the auto eductor. While this is an expensive piece of equipment (and the actual saving in cleaning costs per catch basin is questionable when maintenance, depreciation and interest on investment are taken into account) the eductor serves many useful purposes. Aside from cleaning catch basins it can be employed for pumping out flooded areas and as a mounting for a snow plow. A limited number of these machines are well worth while having in any maintenance department.

Sewers are cleaned with rods and hose flushing at regular intervals. Obstructions in badly clogged sewers are removed with a mechanical sewer cleaning device.

The photographs shown on an adjoining page indicate the different types of equipment used in connection with street cleaning and maintenance. Particular attention is invited to the tractor-trailer outfit which can be mounted either with a dump body or flusher tank.

Local Group Created To Fight City Decay

A bill to authorize formation of neighborhood improvement organizations has been introduced in the Missouri state legislature. It aims to permit property owners to improve the character of the neighborhood or to protect it from undesirable change. The National Association of Real Estate Boards has drafted the proposed act following study and conferences extending over the last two years. Harland Bartholomew, St. Louis, and Frank Watson, in charge of the Purdue University housing experiments, were active in the preparation of the proposed legislation which will combat blight or threat of blight of city districts.

The plan would work through existing machinery of city government and city planning. Principal provisions are: (1) Definition and bounding of neighborhood areas. (2) Setup of machinery for the official adoption of a plan in which are provided zoning or rezoning, improvement or alteration of streets, creation of parks and recreation facilities, plantings, location of public utilities, building restrictions, and progressive elimination of non-conforming uses. (3) Appeal to courts. (4) Execution of plan on the same basis as if it were originally adopted by regular city ordinance.

Water Supply and Sanitation

Modernization of water service and extension of sewage and other waste disposal facilities constitute major features of the municipal works program

Samuel A. Greeley
Hansen and Greeley, Consulting Engineers
Chicago, Ill.

DURING the past five years there has been a marked advance in the facilities available to municipalities for the improvement of their water supply and sewage disposal systems. Normal interest in the improvement of these services has been stimulated by the availability of federal grants and loans, by the relatively large increase in public expenditures, and by the increased demands on the part of the public for improved water quality and for the removal of objectionable sewage pollution from streams. The forward looking city engineer, therefore, must be posted on changes in practice so that he can provide the best and most economical structures and equipment and also arrange for financing improvements.

There are many degrees of efficiency in the performance of these vital municipal services. While satisfactory purity of public water supplies is commonly attained, there are many supplies which are deficient in quality—as regards hardness, color, and iron content—or deficient in quantity so far as distribution and ability to meet maximum rates of consumption are concerned. In addition, the general efficiency of structures and equipment can often be sufficiently improved to amply justify reconstruction and replacement, particularly in connection with pumping equipment, the reduction of friction losses in the distribution system, and the use of storage tanks to permit intermittent pump operation. Major changes in source of supply are sometimes desirable. For instance, a municipality supplied by deep wells furnishing a hard iron-containing water might well scrutinize the possibilities of developing a surface water supply that can be made entirely safe, suitable and attractive by modern methods of water treatment.

Sewage facilities need also to be checked. Many of the sewer systems built one or two generations ago are now inadequate because of insufficient depth, insufficient capacity or perhaps because a combined storm and sanitary drainage scheme is in use. The desire for cleaner waterways may require the adoption of sewage treatment or the extension of facilities to improve the effluent from an existing plant. Improvements in the art and in equipment may justify disposal plant additions such as screenings-grinders to save labor, and sludge-gas engines to develop power. In one community sludge-gas engines were installed several years after the treatment plant was completed and as a result the annual power costs were reduced by about $25,000.

Refuse collection and disposal service has suffered in some municipalities because curtailment of expenditures made it impossible to replace wornout equipment. On this account there is immediate need for rehabilitation, particularly in regard to collection service. Studies are being made in a number of cities before the acquisition of new equipment to determine the most desirable collection route layout and the size and type of vehicles to best suit particular service requirements of the community. Thus the pressure of depression economy has been a helpful factor in directing attention to possible gains in efficiency and reduced costs in handling municipal refuse.

Forward looking city officials have for many years made use of the general plan to provide for an orderly development of water and of sewage facilities and to make certain that the structures as built could easily be enlarged to meet future needs. An illustration in the water works field is the design of the distribution system so that its usefulness may be extended from time to time by the addition of elevated storage or booster pumping stations with ground storage. Sewer plans can often be arranged so that later construction of relief sewers will not overtax the capacity of the existing system. Sewage disposal plants should be designed so that space is provided for horizontal extension and suffi-

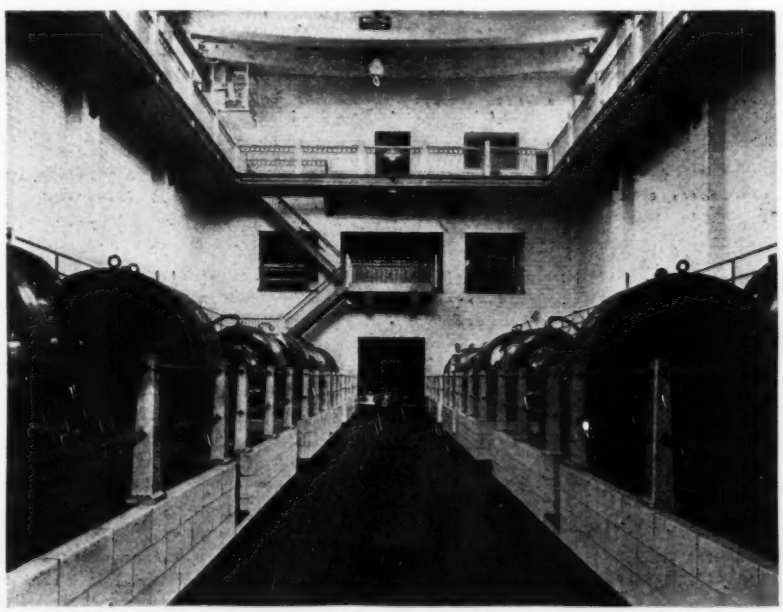
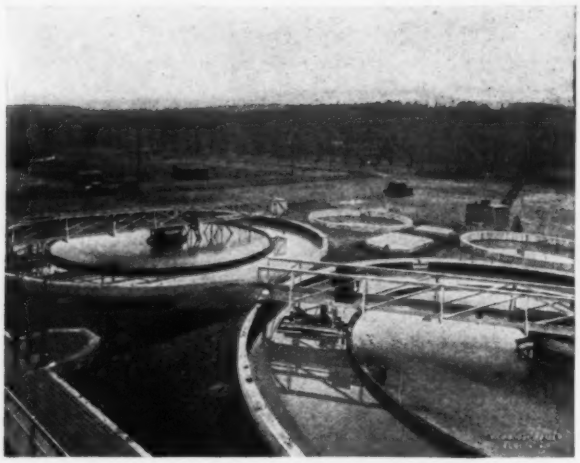


FIG. 1—CENTRIFUGAL PUMPS installed in the 300 m.g.d. Cermak pumping station in Chicago. Refinements in design have constantly improved the efficiency of this type of pumping equipment.



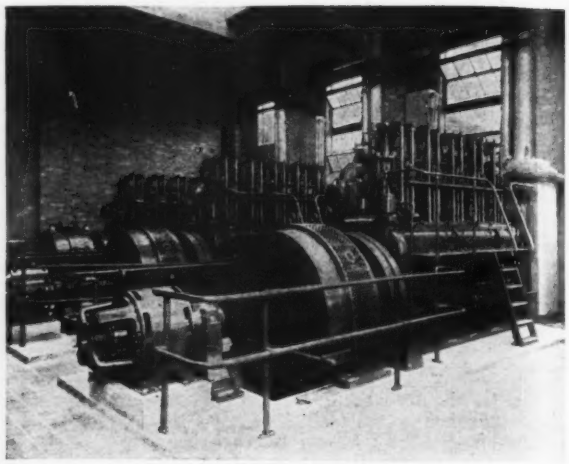


FIG. 2—MECHANICAL DEVICES are playing an increasingly important role in sewage treatment. Typical examples of this trend are the magnetite filters installed in the new Elmira, N. Y., disposal plant (left), and the sludge gas engines (right) which produce electric power in the Coney Island plant.

cient hydraulic head is available for the future addition of more complete treatment structures. The usefulness of advance planning has been emphasized by the recent rapid development of all municipal service facilities.

During the depression many improvements were made in water supply and sanitation practice. The development in centrifugal pumping equipment is a good illustration. Fifteen years ago the maximum efficiency to be expected from a small centrifugal pump in water works service was about 79 per cent—they are now available with maximum efficiencies as high as 86 per cent; the same general improvement trend has occurred in larger units. Not only has efficiency been improved but pump characteristics, too, have been studied so that they can be designed to operate more smoothly with less depreciation. In pumps for sewage plants the specific speed as well as the rotating speed is now given consideration; for different types of pumps upper limits for the specific speed are determined by operating experience, pump sizes and heads.

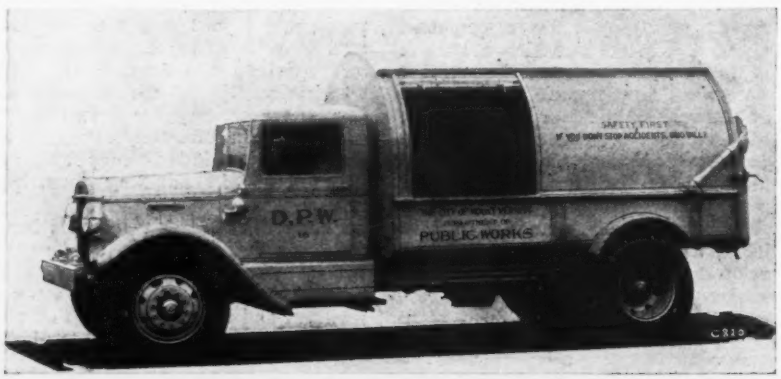


FIG. 3—REFUSE COLLECTION EQUIPMENT MODERNIZATION results in low-cost operation. The adoption of closed-type bodies, such as pictured above, eliminates dust and odor nuisances.

Improved methods of construction have tended to reduce initial costs so that betterments are brought within the means of municipalities. This is true, for instance, in regard to construction equipment for trenching and tunnelling for water mains and sewers, and in the preparation and placement of concrete.

In drafting a general plan for municipal water and sanitation works consideration should be given to providing sufficient legal powers to the community through its charter and ordinances in respect to methods of acquiring desired improvements. In many cases the available means of raising funds and meeting operating expenses are not altogether satisfactory and equitable. Sewage and refuse disposal can often be provided on a more equitable basis by revamping methods of charging for this service. The unification of administrative control and the elimination of overlapping operating departments are sometimes items

of importance. Arrangements for financing costs should be made an integral part of the general plan. To facilitate understanding of present conditions and for forecasting future conditions, attention should be given to operating records and cost accounts, as has been done for instance in the field of refuse collection and street cleaning by the Committee on Uniform Street and Sanitation Records.

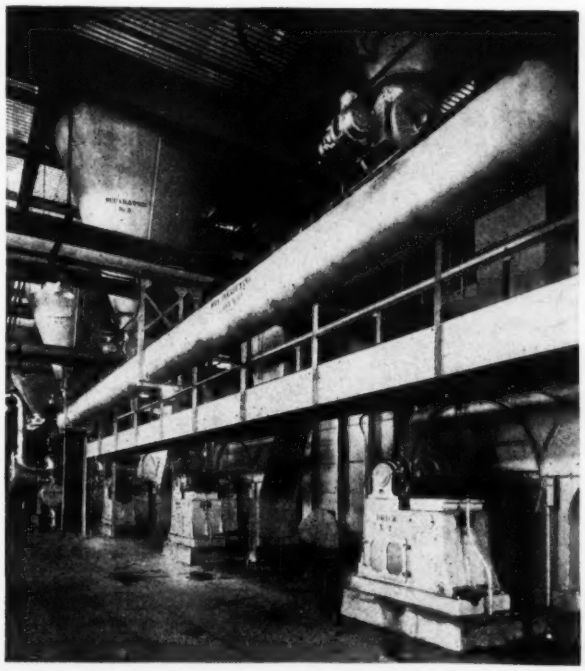
Standards are high

The first attention of municipalities is inevitably given to acquiring an abundant supply of water, and the second to securing the safety of the water as regards the public health. More recently the public has required attention to improvements in other qualities of the water and in the disposal of the spent water of the community. No longer is water considered satisfactory unless it is reasonably soft and free of color and iron as well as bacteriologically pure; and no longer is the discharge of untreated sewage into the nearest waterway tolerated. Thus, standards in water supply and sanitation have been raised at least as rapidly and perhaps more rapidly than the facilities and finances available to satisfy these requirements.

The quality of a water supply to meet the desires of the public is relatively well understood, but these demands are not so generally satisfied. It is clear at the present time that further improvement is needed in many municipalities as regards the physical characteristics of water even though the water may be satisfactory as regards its freedom from disease germs. In sanitation, the development and attainment of satisfactory standards of waterway cleanliness has developed more slowly. Attention was first directed to sewage pollution as it affected the safety of public water supplies and the operation of water treatment plants, and then to the avoidance of gross nuisance. Now sewage treatment requirements are being directed toward the removal of objectionable pollution as regards the use of the waterway for bathing, stock-watering, fishing, shellfish marketing, and general recreation. Statistics are gradually being compiled to show the harmful effect of improper sewage disposal not only on bathing and recreation but also on the general health of the community. Insufficient or improper sewage disposal fosters in municipalities a feeling of insecurity which is not removed until pollution is abated.

The reports of the committee on water supply engineering of the American Society of Civil Engineers make a complete and illuminating record of the work being done and the equipment recently developed in the field of water supply. These reports cite the advances in water pipe and pipe coatings and in protective lining and, as a corollary, the means that have been developed for reducing corrosion in pipes by special treatment processes. Studies have been undertaken regarding the likely effect of air-conditioning equipment on the needed quantity of water, on the capacity of sanitary sewers and sewage treatment works. A greater variety of methods of metering water makes some economics possible There has been a marked development in the automatic equipment now available, as for instance in the control of chemical feed and the operation of multiple pumping units. Improved design of check valves has permitted reduction in head losses and has been helpful in the control of water hammer.

Improved facilities in sanitation are too numerous to list completely. It is pertinent, however, to call attention to a few. A number of sewage treatment plants have added mechanical equipment for cleaning screens and grinders for disintegrating the screenings and returning them to the sewage. Increased interest has been shown in facilities that permit the preparation of sludge for fertilizer. In one plant this has been accomplished by the installation of a rotary dryer in which the sludge removed from open sludge beds has been dried with the excess gas from



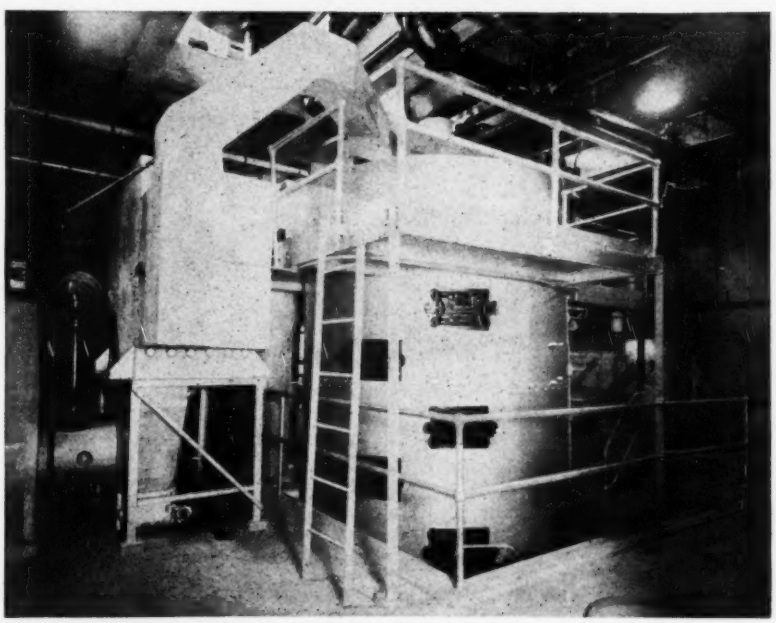


FIG. 4—SLUDGE incineration, a comparatively new development, is being widely used in sewage disposal practice. Below is shown a 29-ton multiple-hearth mechanically rabbled type of incinerator installed at the new Auburn, N. Y., plant. The Calumet (Chicago) 40-ton sludge dryer and suspension burning type incinerator is shown at the right.

the digestion tanks; retail sales of the dried material have been favorable. In other places equipment has been installed for breaking up the sludge removed from open drying beds and this is sold without further dewatering. Sludge gas engines have been installed in a number of plants.

FIG. 5—FERTILIZER SALES from sewage disposal plants are encouraged if digested sludge is properly sized for garden use. This can be done inexpensively with a portable machine now available.

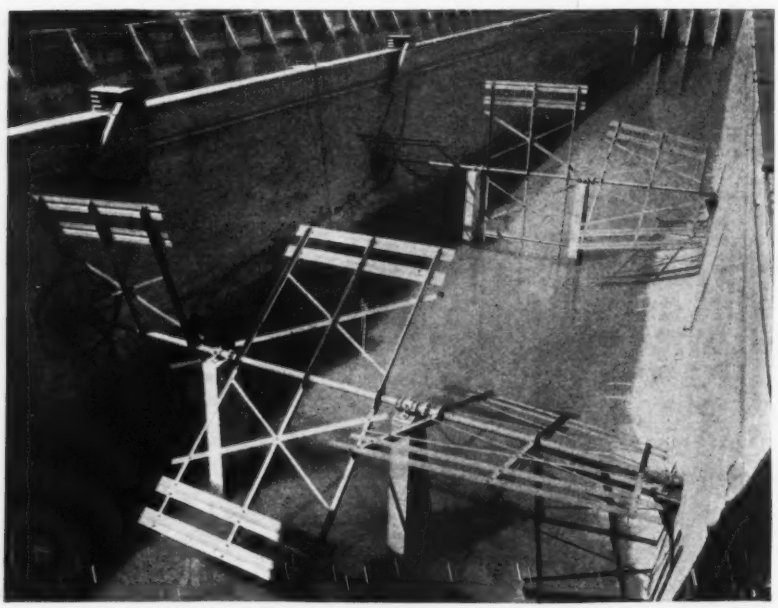


FIG. 6—BETTER WATER QUALITY at lower cost can be obtained by using modern mechanical equipment. These flocculators installed at the Louisville, Ky., waterworks insure proper conditioning prior to filtration.

These have been connected to pumps or to blowers or have been used to drive generators for the production of electric power.

Some years ago pre-aeration and sedimentation structures were built at Decatur to operate between primary sedimentation, tanks and trickling filters. It is of interest to report that additions of this type are now being made to the Southerly sewage works at Cleveland. The original plant comprised Imhoff tanks, trickling filters and other appurtenances. The new construction includes aeration and sedimentation tanks between the original Imhoff tanks and the trickling filters, with reconstruction of the filter distribution system to permit larger doses of sewage. The effluent filters of the magnetite type are to replace the original final settling tanks. The compressed air blowers will be operated by sludge gas engines. At Springfield, Ill., mechanically cleaned screen, pre-aeration for the removal of greasy matters, and sludge gas engines have been installed as measures to keep the treatment plant up to date.

It seems likely that in the future wider consideration will be given to the installation of mechanical dewatering equipment of the vacuum filter or other types, and to incinerators for the disposal of sludge.

The attention of public officials and designing engineers is being directed to measures for odor control in sewage treatment. Steps that have been taken include chlorination of the sewage at various points in the collecting system, limited pre-aeration of the sewage, trapping and cleansing of the objectionable gases, and better facilities for maintaining clean and odorless conditions in and about the plant structures.

When planning improvement of garbage and refuse disposal facilities attention should be directed to the acquisition of better collection equipment and to better routing of the collection service. Collection vehicles of the totally enclosed or semi-enclosed type, eliminate objectionable nuisance features of garbage and refuse collection.

There has been much interest in the disposal of garbage in the sewers. Two schemes have been considered. One proposes the use of individual grinders to be set in the kitchen, the object being the reduction or elimination of collection in trucks. The other scheme comprises the collection and delivery of the garbage to some central point where it may be ground and discharged into a large sewer. A project of this sort has recently been installed in St. Louis. The discharge of ground garbage into sewers requires a knowledge of its effect on sewage disposal works. A considerable amount of experimental work has been done to determine the increase in oxygen demand of the sewage by the ground garbage and its effect on the behavior of sludge digestion tanks. Further large scale operating experience is needed but the procedure has sufficient merit to justify investigation.

During the last 8 to 10 years municipalities in this country have experienced three very unusual and difficult situations. They have passed through a severe drought, they have experienced very great floods, and they have passed through a difficult period of business depression. Extreme conditions such as these test the adequacy of the public facilities. Much has been learned and many of the difficulties encountered during drought and flood can be corrected at reasonable cost. Undoubtedly, forward looking communittes will profit by these experiences. This is especially true in the water supply field where protection of structures essential to the maintenance of service against high water will be undertaken and where the adequacy of the supply to meet long periods of reduced rainfall will be increased.

Of particular note is the widespread interest throughout the country in the removal of objectionable pollution from waterways. There seems to be no question as to the public desire to rid the rivers, lakes, and ocean water fronts of pollution. These opinions are being crystallized through pending federal legislation directed toward a national program for suitable sewage disposal and through the dissemination of knowledge by the reports of the National Resources Committee.

Municipal officials during the coming years will be required to keep the services of water supply and sanitation well up to date and this will require careful study and adaptation of the many new methods and appliances constantly being made available.

Guiding City Growth

Halting random development and decay of blighted areas are the principal problems that confront city planners as they set out to rebuild communities in harmony with needs

Robert Kingery
General Manager,
Chicago Regional Planning Association

LESS than two decades ago most city planners and real estate developers subscribed to the doctrine that there was to be no limit in urban population growth. Big cities were to be even bigger. New York was to exceed London, Chicago was to exceed New York and so on ad infinitum—all cities were to grow larger without restraint. Recently, however, there has been a change in viewpoint and with it some sober thinking on city growth.

Eyes that were focussed too sharply on population growth (due to rapid development on the fringes of a metropolis) did not observe the slow but certain disintegration that was attacking the older parts of the city. Increasing age of buildings, lack of modern facilities, new standards of living —these were some of the factors that were influencing blight and decay.

These fundamental organic changes were overlooked by most city planners and officials as they reached for blind objectives symbolized by the abstract theme, "the city beautiful." The real city, where people work, sleep and play, was forgotten.

Some progress in the right direction has been observed but too often false starts are made. There is still much fumbling with small fractions of a problem and consequent failure to fit individual solutions into a composite whole. For example, housing projects are launched in a slum district with a view toward eliminating the slum and substituting low-cost living quarters. The result: A fragment of slum clearance, houses which are not low-cost (unless taxes are reduced) and a density of population several times greater than the previous number on the same acreage of land. Put forty or fifty years of age on these now modern "low-cost housing projects," and unheard of population densities will result, and with it even greater blight and social problems than now exist.

If we are to insure logical development in harmony with present and future needs, comprehensive planning must be more widely undertaken.

Planning has for its objectives the correction of past mistakes and the prevention of future errors in urban development. City planning is mostly concerned with replanning and reconstruction for present needs. Regional and suburban community planning, on the other hand, is concerned largely with future development.

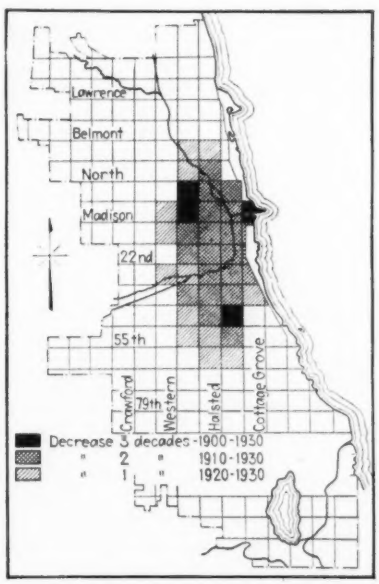


FIG. 1—POPULATION-DECREASE areas in Chicago have gradually expanded during the last three decades.

Until recently we all guessed about the proper relationship of industrial, business, apartment and residential zones. Possibly our guesses were "educated" but they were, nevertheless, guesses. Despite the availability of experience records dating back one or more centuries, they were seldom used. In some studies of major cities and metropolitan districts we even ignored the valuable lessons learned in the last 50 years of rapid industrial growth.

Today, we approach the planning problem differently. In planning for the Region of Chicago, a typical example, an industrial study was first made. The results obtained were put to important use in zoning, subdivision plotting, highway layout, parks and playgrounds. Instead of following the usual pattern of such a study, gathering statistics which ended with number of employees, their ages and sex, value of raw materials, value of products, etc., the Regional Planning Association collected additional facts such as: (1) the number of acres of land occupied by industry of each major type; (2) the relationship of that acreage to the number of employees, and (3) the relation of the number of employees to the total population.

Detailed examination of 8,300 manufacturing establishments, more than two-thirds of those operating in the 15-county region of the Chicago metropolitan region, revealed that there were 150 employees and 1,000 people for every 4 acres of land used by industry (excluding railroad yards). This provided a definite formula by which population forecasts could be correlated with industrial land requirements.

A study was also made of business area uses and needs. Previous to this it has been noted that real estate subdividers were plotting high-priced business frontage not only on property facing main thoroughfares and along all streets intersecting at half-mile intervals, but even along streets located at quarter-mile intervals; in addition it was not unusual to have a few extra "local business" centers thrown in. Our findings, concurred in later by similar studies in other parts of the country, indicated that two people support one front foot of business, and that for each 1,000 people 1½ acres of business property is actually used. On that basis it was calculated that the average subdivision in the Chicago region sometimes provided as much as 20 times the required business frontage.

Analyses were made of residential land use in both industrial and residential communities outside the city of Chicago. It was learned that the average density of population per acre of suburban land was 12 persons; removing industrial, business, park and other public land from the total it was found that there was about 66 acres of residential land per 1,000 people. Experience of park and playground authoritiesties indicates that for each 1,000 population ten acres of land (including school grounds) is a desirable objective. Communities with smaller land allotments usually suffer from such ills

© Chicago Aerial Survey Co.

FIG. 2—LACK of planned sub-division regulation produced this crazy-quilt pattern. A community layout such as this is difficult to serve with traffic arteries and with economical utility service systems

as juvenile delinquency, low property values and tax delinquency; those provided with more than ten acres per 1,000 usually grade high in all those measurements which reflect desirable community qualities.

Applying the data

These studies for the Chicago regional area, omitting Chicago proper, showed that for each 1,000 population, plans should be made for the following land areas uses:

Industrial	4 acres
Business or commercial	1½ acres
Residential	66 acres
Parks and playgrounds	10 acres

The estimate of population in the Chicago region for 1960 has been fixed at 7,300,000—4,500,000 in Chicago and 2,800,000 in the suburban area of the fifteen counties. If this estimate is accurate industry will require about 29,000 acres of land, thus leaving unoccupied 27,000 acres of property already classified for industrial use. Business will occupy only one-half of the area zoned for such used in Chicago and less than one-fifth of that set aside in other municipalities. Subdividers have generously provided 1,955,000 recorded lots of all kinds and sizes in the 15-county region; only 937,000 are now occupied. Even by 1960 the most favorable estimates indicate that there will still be a surplus of from 500,000 to 600,000 lots.

It is reliably stated that within Chicago alone 120,000,000 people may be housed without a violation of the building and zoning ordinances. Not to be far outdone, sixty suburban communities have drafted their zoning ordinances so that they can, in total, house 9,000,000 more people.

At the peak of subdivision activity twelve years ago, the Regional Planning Association attempted some restraint of the irresponsible subdivider. In cooperation with the better real estate interests, subdivision regulations were drafted which set up certain requirements. These concerned the adoption of broad streets, prohibition of "jogs" in connecting streets between adjacent property, allocation of fewer "business" lots and the use of larger lots. Regulations of this type were put into effect by fifty cities and eight counties. Unfortunately, there has been no practical or effective way to prevent further plotting of unnecessary lots.

Zoning has been employed as a sound means for stabilizing growth and directing it to properly classified land. This has been a good influence although zoning regulations have been far too prodigal with industrial, business and apartment areas. Further progress is now being made, however, and unbalanced ordinances are being modified. Apartment zones and even some business zones (destined for perpetual vacancy as such) are being restored for single family dwellings. In Niles Center, for instance, where there was a great excess of both business and apartment zone area, nearly 100 acres of land have been rezoned for single-family homes. At least twenty suburban communities in the metropolitan region are amending their zoning ordinances on the basis of facts instead of boom-period hysteria.

One of the facts now being faced by our cities is the obvious economic impossibility of providing adequate municipal services—sewer, water, and even fire protection—on the scale called for by the fabulous schemes of the '20s. Existing sewers and water mains without reconstruction might serve for many decades under a well-balanced land use, but they would be wholly inadequate were the land to be covered at the intensity planned in some of the zoning ordinances.

Streets, too, as presently laid out, would be incapable of carrying the load of traffic such a density would put upon them. Were some of the suburban municipalities in the Chicago area to achieve the growth envisioned in their zoning ordinances, not only would the conduct of industry and business be impossible, but residential values would be undermined. Stagnation, then blight and finally slum environment would follow in rapid order. Past experience indicates that broad streets, boulevards and parkways must form the basic pattern of a new city and the rehabilitation of the old one.

Parks and playgrounds have also been proven to be a fundamental economic and social need. In neighborhoods where there are public land spaces, property values as a rule do not slump. Park areas, therefore, are not only beneficial for the direct recreational service which they provide but indirectly they can be credited with upholding property values and preventing disintegration.

Depopulation and decay

And now a word about depopulation and the need for planned rehabilitation.

The Chicago Plan Commission found that in one district of the city

(covering 36 sq.mi.) the loss of population in the decade between 1920 and 1930 was 146,000; over a 20-yr. period the loss has been 263,000. Not only has population been decreasing but industrial and commercial operations have also been on the decline. Similarly, in St. Louis, the City Plan Commission found that a district comprising one-quarter of the city's area lost 43,000 people in the decade from 1920 to 1930; one-eight of the city within the above district lost 65,000 in a 20-year period, and that same area in 30 years lost 92,000.

This depopulation trend in two cities is typical of what is taking place in many others. It is an accurate index of disintegration and should be recognized as such. Furthermore, remedial measures must be taken to halt this decay. No simple antidote will correct this condition—major operations under governmental supervision are required. These can be carried out as follows:

(1) Major arteries must be opened. Usually the business center is surrounded by a zone of disintegration and the daily metropolitan travel must cross the blight area. Broad streets, park-like in character, will let in the light as well as facilitate traffic movements. Property adjacent to such thoroughfares becomes habitable once more and desirable for residential uses. Private enterprise will thus be encouraged to rebuild.

(2) Playgrounds and park areas should be developed to supplement the traffic arteries, based on the formula of ten acres available for each 1,000 population. When people are assured of open space and recreational facilities, they will be encouraged to return to the hitherto blighted zone.

(3) Zoning regulations must be adopted and steadfastly adhered to in order that land use will be properly protected. Sound zoning will salvage and prolong the life of the city's utilities, as well as those that are privately owned. Street cars and other forms of transportation in former blighted areas will again become profitable. Industry in its proper place will be reassigned sufficient area but not more room than it needs, and good residential neighborhoods will be re-created.

These are the objectives sought by comprehensive city planning. The problems that must be overcome to realize these objectives belong in the realm of the city engineer and he will play an important part in furthering their solution. Guiding growth is an exact science and the airy and vague generalities of the pseudo-city planner are a thing of the past.

River Cities Are Rezoning To Prevent Flood Loss

THE now well-tested planners' tool of zoning may be utilized to help prevent recurrence of some of the recent flood losses suffered by Ohio Valley cities. According to Paul Oppermann, assistant director of the American Society of Planning Officials, at least one city has rezoned its riverside land and two others are contemplating it.

New Albany, town of 23,000, on the Indiana side of the Ohio River, will turn its lowland into park area. Citizens who formerly lived near the waterfront are encouraged to resettle elsewhere in the town. On the other side of the river, Louisville, Ky. is exploring the possibilities of zoning against the improper use of its riverside land. An amendment to Louisville's zoning ordinance would create a new type of district within which no new residential structures could be erected and no existing residential building could be structurally altered. The amendment's purpose is to forestall new building in some of the lowlands along the Ohio. Appropriation of a special fund has also been proposed with which to acquire a part of this area for park developments.

In Cincinnati a proposed zoning amendment submitted to the city council would prohibit the building of any type of dwelling in Industrial "B" and "C" zone districts, which include more than nine square miles of the city lying almost entirely in the area that was flooded.

Although the belief is growing that proper flood control is not a local matter alone, but one calling for the coordinated activities and the cooperation of federal, state and local governments, communities affected can do some things toward "getting out of the river's way," Mr. Oppermann says. They can discourage the use of the lowest, most flood-vulnerable grounds. Instead of locating new homes, new industries, railroads and highways where they are exposed to flood waters, there will probably be in the future a much stronger public sentiment for going to high ground with these new developments wherever feasible and for letting the river have a little more elbow room. There was a time when proximity to the water and the facilities of the "river trade" was a necessity to industry and commerce. Availability and increasing use of other means of transportation have brought new elements into the picture.

Municipal Labor Employment Policies Bettered

SAVING municipal money and providing fairer conditions of work for laborers is the objective of the new employment practice now in force for laborers in Duluth, Minn. This city recently established by ordinance a Bureau of Labor to regulate employment of skilled and unskilled workers, giving the laborers, in effect, a civil service standing.

In this move, according to the Civil Service Assembly, Duluth is following a few other large cities in the country that have developed similar plans for taking municipal unskilled labor out of patronage, at the same time providing a better check on the standard of work performed. According to latest information there are wide variations in wages among cities and little attempt is being made to establish uniform specifications.

Toledo six months ago established new rules for labor personnel in the employ of the city by an ordinance that extended the classified civil service to include all laborers. The Toledo Civil Service Commission prepares eligible lists from which all municipal laborers must be selected. Although no written tests are given, all applicants must demonstrate that they are physically fit and adapted to the work. A stabilized compensation system was also set up for the various types of labor, making it possible for department heads to budget estimates accurately by using unit costs per man-day or man-hour.

The new Duluth ordinance establishes an employment register for persons eligible for employment by the city. Potential employes are graded from common laborers, and examinations are given to persons wishing to be registered in the latter class.

Few cities, according to the Civil Service Assembly, require little more than a medical examination of laborers. Most of them certify laborers for employment in the order of priority of registration or application, without regard for aptitude, fitness, etc. One municipality selects its laborers by lot; in another, vacancies for most of the skilled labor positions are filled by nominations made by the department heads.

Detroit, Cincinnati and Milwaukee have established definite standards for certain types of labor positions, however. Under the Milwaukee system labor jobs are divided into wide classes, as heavy work, simple work, and work requiring ability to climb. Tests are given for each of these, to list properly the applicants for jobs.

● CITY WORKS ADMINISTRATION

The City Engineer Today

Formerly a technician concerned only with the professional direction of projects initiated by others, he is now called upon for leadership in the determination of sound policies and plans

Loran D. Gayton,
City Engineer,
Chicago, Ill.

"There are three factors that an engineer during his life's work will be called upon to control, or at least be given an opportunity to do so—*material things, living men,* and *vitalizing policies.* Of these, to paraphrase the celebrated dictum of St. Paul, the greatest is policy. The technician can control the first, and sometimes if he is tactful can control part of the second, but it is only the engineer with true professional instinct who can control the first two and initiate the third. He who directs the policy is a fashioner of things and a leader of men."

THE ABOVE PARAGRAPH, quoted from the works of that eminent engineer, the late Wm. Barclay Parsons, seems to me to point out the broad highway along which the municipal engineer must travel if he is ultimately to reach the goal of maximum usefulness to his community.

In the past the municipal engineer occupied a subordinate position in governmental affairs. He was considered strictly a technician and it was generally assumed that his education and training limited his activities solely to the technical field. It was his job to plan, design and construct the public improvements required by a growing community. He was the builder of roads and bridges, water supplies, sanitary works and communication systems. But when it came to the management of what he produced, and the government of the area that he served, he was pushed aside—and there remained, an inarticulate bystander.

The engineer calmly accepted the place allotted to him in the general scheme of things. In fact, he found so many technical problems to challenge his thinking and intrigue his interest that he cared little to assert himself in other matters. As a technician the municipal engineer did his work well. Urban life today, wherein the average man enjoys a standard of living far above that of the kings of old, bears witness to this statement.

When cities began growing at a rapid pace not so long ago, the municipal engineer found himself cast in a more important role. Growth expansion required more extensive and complicated public works. The construction of these projects not only called for technical knowledge and skill but also for ability to organize and direct the activities of many men. Under pressure of necessity, therefore, the engineer gradually developed qualities of leadership. As a leader, however, he confined himself primarily to the direction of those physical projects coming under his jurisdiction. He was still content to remain in the subordinate place allotted to him, and made no attempt to exert his leadership in matters of government or in public affairs. The conviction still remained that the shaping of opinion and policy in municipal affairs should be left strictly to others. Thus it was only through sheer necessity that the engineer moved forward to assume a position of greater influence in community life. But he was not yet looked upon as qualified to mold public opinion or to initiate policies in governmental matters and, unfortunately, he did not see fit to force himself into these fields.

Depression thinking

During the recent era of comparative prosperity many public and private engineering improvements were carried forward in every section of the country. Plenty of work of a purely technical nature kept engineers occupied and interested and, as in the past, the profession paid little attention to the fact that many ill-advised policies were promulgated. Suddenly, the era of prosperity came to an end, construction came to a standstill and engineers were thrown out of work.

In the years of unemployment that followed the engineer had an opportunity to think about something other than the work by which he earned his daily bread. He had time to consider the effect of social and economic policies on his wellbeing. This led him to the discovery that by education and experience he was peculiarly fitted to intelligently analyze and discuss such matters. Furthermore, he saw himself as an important part of society and learned to appreciate that only as society as a whole prospers can he as an individual prosper.

As a result, the engineer has begun to make himself heard in matters outside of his purely technical calling, and he has been somewhat astonished to find that in a great many instances his counsel is welcomed and appreciated.

Other factors have contributed to wider recognition of the engineer in public service. Their origin can be traced to the decade prior to 1930 when cities had lots of money for public improvements. Expenditures were made on a grand scale with no thought to the time when the day of reckoning would come. As a result, many municipalities found themselves in desperate straits when the boom period ended. Incoming city administrators inherited unwieldy debts, tax collections were difficult to make, and in many cases bonds were defaulted.

These conditions have focussed public attention on city officials and administrators—something that had seldom been done before. Critical scrutiny of this kind has made public officials more cognizant of their responsibilities to the taxpayer.

Municipal officials today are using great care in the determination of new policies and in planning for the expenditure of public funds. And this is where the education, training and experience of the engineer becomes of the greatest value to the elected official who must depend upon the public favor to continue in office. This is the golden opportunity for the municipal engineer to take his first steps upon the broadened highway of public service, namely, the route that leads to the

NIGHT enhances the splendor of the city engineer's empire

shaping of governmental policies. But if the engineer is to successfully maintain and strengthen his position in the initiation and shaping of policies he must have what Parsons called "professional instinct." This embodies something more than technical and administrative ability.

It is sometimes claimed that a municipality is similar to a large corporation and that its various activities can be carried on the same as those of a great business enterprise. I do not believe that this is a correct comparison. A corporation is governed by a president and a board of directors, with almost dictatorial powers as to policies and methods of doing business; stockholders are scattered far and wide, unknown to each other, and have practically nothing to say concerning the action of those in charge of operation. The typical American commonwealth on the other hand is governed by a mayor and a board of aldermen who are dependent upon the votes of the people for their elective positions, and who in one way or another are answerable to the people for their actions. In our large cities the electorate is made up of many groups representing almost every nationality, creed and color, all of whom have dissimilar viewpoints and different demands.

These various groups are represented by numerous civic organizations, all active and persistent in urging their demands. Individuals, too, can combine temporarily in sufficient number to wield potent influence on elected officials. It becomes the duty of an elected official, therefore, to do his best to satisfy the wishes of the greatest number possible—he can never hope to secure the approval of the entire electorate. If a public official can so conduct his office that he receives the approval of more than 50 per cent of the citizens he has done very well. It can be said without fear of contradiction that the elected official responsible for shaping policies, does not occupy a bed of roses. If the problems of municipal officials have been difficult in the past, those to be faced in the future will be greater in number and still more difficult of solution.

As stated before, previous to the depression the taxpayer paid little attention to his elected officials and evidenced small interest as to where or how his taxes were spent. But now he is superinquisitive and critical as to every action or attitude of those in authority. Practically every citizen is clamoring for a reduction in taxes, while at the same time demanding more and more service. In many cases these demands have reached a point where they are unreasonable and impossible. In order to insure sound policies and programs of development, elected officials will require assistance and support. Herein lies the opportunity for the municipal engineer with the "professional instinct."

Public works construction and maintenance are among the most important activities of every city. All improvements must be carefully planned and analyzed as to necessity and economy and no one is better fitted to do this than the engineer. And if public officials are to discharge their responsibilities properly they must depend more fully on engineering talent.

To be of the greatest value to his community the municipal engineer must acquire the viewpoint of the elected officials and at the same time visualize public works through the eyes of the taxpayer who supplies the funds. If the engineer takes the attitude that the officials or the public are always wrong, because their viewpoints differ from those of the technician, he will fail to be of real assistance in shaping sound policies. On the other hand, if he cooperates with the elected officials, giving the best of his technical knowledge and ability without personal bias, his assistance will be of real use and permanent value.

I have attempted to point out what I believe is a new and far reaching opportunity being presented to municipal engineers, but if the engineer is to make the most of these new opportunities and continue to be welcomed to the discussions of policy-shaping councils, he must be more than a technician or an organizer—he must be an administrator as well. To develop this phase of his activity properly he should join civic organizations and enter into discussions concerning the needs of various localities. If possible he should associate himself with such groups as the local chamber of commerce, to gain the opinions of businessmen and employers. These viewpoints are all vitally important in furthering the welfare of the city.

The engineer confines his public activities altogether too much to technical societies and, as a result, the effect of his opinion on vital questions seldom reaches beyond the confines of these organizations. To a great extent the benefits of his technical knowledge have been lost to his city. Too frequently he has taken the attitude that politics is beneath his dignity, and consequently his comment on civic matters is seldom more than criticism. As a rule this criticism comes only after some project has been consummated—too late to do any good.

I believe our universities for some time have sensed the demand for a new type of engineer, and educational courses are being broadened to include sociology, political science and finance in addition to the usual technical subjects. Reinforced with this background the engineer is destined to become a powerful influence in his community.

The municipal engineer has in the past made a good record as a technician. There is every reason to believe that in the rich opportunity before him he will make a better record in performing wider public service.

Organization and Personnel

Effective administration of a municipal engineering department depends upon good organization, careful personnel selection and proper delegation of responsibilities

E. P. Goodrich
Consulting Engineer,
New York City

FOR SEVERAL million years, nature has been experimenting with social organization and social leadership. Some of the bees and ants have evolved an organization which seems to be almost perfect as far as the average social group is concerned. But even here, some hives are industrious while others seem lazy. Nature's way of combatting laziness is the gradual decimation and elimination of the whole colony. Such measures are heroic, however, and nature early turned to leadership as another solution to the problem. The bison herd, the wolf pack, the huge herds of cows in the summer pastures of the Alps, and other gregarious species acquired leaders, namely, individuals who preceeded and led the others from one grazing or hunting ground to another. There are indications that physical strength has always been a major element in such leadership. But intelligence too, has sometimes been demonstrated not only among the lower animals but in clan and tribal relationships among primitive men as well.

The innate "division of labor" (to use a term common in modern economics) between the sexes in lower animals and in primitive man became augmented in civilized human societies. Thus, under many of the simplest forms of society which are guided by leadership, a certain amount of division of labor (which is the fundamental element of organization), has always existed.

Organization and leadership became more and more intimately related with the gradual evolution of human society. Thus, administration was introduced — purely a device to direct the division of labor. The leader quite naturally adopted the role of administrator. However, when the individual who occupied the administrative position did not also combine the quality of a good leader this resulted in some loss of the total social efficiency. The organization and administration of the recent Kaiser's defeated army, is a good example demonstrating the lack of proper leadership.

Line and staff type

Long experience has shown that the most efficient form of organization is the combined "line" and "staff" type. In this there is division of labor both between and within the several corps (Fig. 1). Efficiency results from the inherent value of a combination of functional activity, with a vertically divided, purely operative, repetitive division of labor. In modern municipal organization segregations generally take the form of departments concerned with the administration and those involving technical direction. The latter are often sub-divided further into design, construction and operation activities.

These subdivisions actually exist even where organizations are small as, for instance, where technical work in two or more activities is delegated to a single individual in order to fully occupy his time. Under such circumstances the individual ability and interests of the leader often determine the scope of his work. Where his natural inclinations lean toward technical design, for example, this work may dominate his attention to the point where administration or construction activities are covered only incidentally and perhaps negligently.

In organizations which include many varieties of technical work and in which the full time of any individual member of the staff can be occupied on some specialty, the degree of division of labor is often carried to an extreme. Such is the case in connection with the design, and to a lesser degree with the construction, of large municipal water and sewerage works; here the staff may quite likely include specialists concerned individually with

FIG. 1—LINE AND STAFF TYPES OF ORGANIZATION FOR A LARGE AND SMALL CITY

A Large City

LINE	STAFF
1 Chief Engineer	1 Hydraulic Engineer
1 Asst. Chf. Engineer	1 Sanitary Engineer
5 Design Engineers	1 Bridge Engineer
20 Asst. Engineers	1 Traffic Engineer
10 Draftsmen	1 Highway Engineer
25 Instrumentmen	5 Designing Engineers
40 Inspectors	10 Draftsmen
80 Fieldmen	

A Small City

1 Chief Engineer
4 Asst. Engineers and draftsmen
4 Instrumentmen and computers
6 Engineering aides (All purpose)

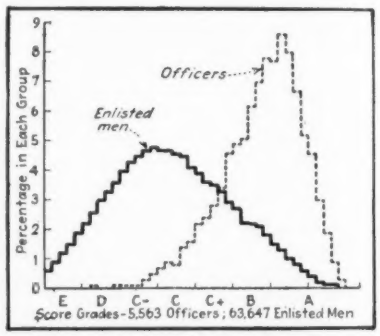


FIG. 2—VARIATION in capabilities as revealed by the U. S. Army "alpha" tests results. The number of men falling in the high (A) classification diminishes rapidly.

In organizations which include many varieties of technical work and in which the full time of any individual member of the staff can be occupied on some specialty, the degree of division of labor is often carried to an extreme. Such is the case in connection with the design, and to a lesser degree with the construction, of large municipal water and sewerage works; here the staff may quite likely include specialists concerned individually with

specific phases of the work such as hydraulic, electrical, or mechanical designs.

In many cases of municipal organization it has been found advantageous to adopt a modification of the military line and staff scheme in one or more departments. This is especially common where the community growth and social demand necessitates the sudden enlargement of a group to handle relatively new items. Such was the case when improved water supplies were demanded to eradicate the typhoid fever menace, and later when increased activity occurred in the development of sewage treatment facilities. Again, in the design and construction of a large bridge (such as that from San Francisco to Oakland) which is beyond the experience of employees in the department that might otherwise naturally be expected to handle the project, the desirability of an enlarged and more highly specialized organization is indicated.

Under such circumstances a consulting engineering specialist is often attached to the organization which also has been augmented by specially trained employees. The retention of special consultants is recommended practice and is used wherever the head of the department is not dominated by so much false pride that he objects to the implication that he is not qualified to handle such enlarged activities.

Form depends on personnel

The best form of any organization differs not only with the size and objectives of the group, but with the availability of personnel. Speaking generally, many men are available for the simpler duties but the number who can successfully hold the higher positions diminishes rapidly as the rank rises. (As shown in Fig. 2 this variation follows closely the standard probability curve). Consequently, it is often found advisable to modify the form of organization to some extent (especially in small groups) so as to reap the greatest advantage from the capabilities of the men who possess leadership and who are available to fill the more important positions.

Some men are natural leaders, born administrators, artists, researchers, or mathematicians; and some men combine two or more of these characteristics to a greater or less degree, but with lessened ability in each field. In a large organization there is room for a considerable number of individual specialists but in a small one, men possessing a combination of capabilities must be secured. As a consequence, a small group will usually fall into the line type of organization, with few or no specialists, while a large one is usually arranged on the line and staff principle. (Fig. 1).

FIG. 3—TYPICAL DEPARTMENTAL ORGANIZATION

According to Activity

HEAD

(Assistant Heads)

Water	Streets	Sewers	Bridges, Refuse, Etc.
Operation	Operation	Operation	Operation
Maintenance	Maintenance	Maintenance	Maintenance
Construction	Construction	Construction	Construction
Design	Design	Design	Design

According to Function

HEAD

(Assistant Heads)

Design	Construction	Operation	Maintenance
Water	Water	Water	Water
Streets	Streets	Streets	Streets
Sewers	Sewers	Sewers	Sewers
Etc.	Etc.	Etc.	Etc.

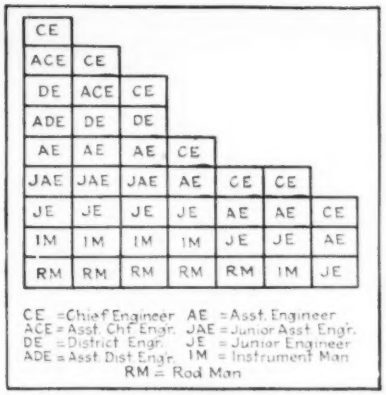

CE
ACE CE
DE ACE CE
ADE DE DE
AE AE AE CE
JAE JAE JAE AE CE CE
JE JE JE JE AE AE CE
IM IM IM IM JE JE AE
RM RM RM RM RM IM JE
CE = Chief Engineer AE = Asst. Engineer
ACE = Asst. Chf. Engr. JAE = Junior Asst. Engr.
DE = District Engr. JE = Junior Engineer
ADE = Asst. Dist. Engr. IM = Instrument Man
RM = Rod Man

FIG. 4—MODIFICATIONS of organization personnel and title designations in cities of various size.

Geographical organization

In an organization where the geographical area of activity is large, travel time with its related cost becomes important. For such cases a geographical subdivision of administration will be found to be the most efficient arrangement. Each of the local units will then be much like a separate small organization with leadership falling under the direction of a district head. In large organizations thus subdivided geographically, staff specialists are often valuable; they can give their time to all of the several district groups, upon demand, or in routine rotation. The highway departments in large states or the construction corps of extensive water systems offer typical examples of this type of so-called geographical organization.

Sometimes when factors other than distance are involved, we may find the geographical scheme used in relatively small areas. In New York City, for example, with its five boroughs, several functional units have combined complete borough maintenance divisions with a "chief engineer" at the head of each, but with a "staff" organization in the headquarters office which is available to all of the boroughs.

The same general type of organization is also found in many smaller cities but arranged functionally and with a non-technical administrative head generally selected politically (Fig. 3). Some experience indicates a lower degree of efficiency in such organizations, compared with both consolidated technical groupings (inclusive of public works offices headed by an administrative technician) and departmentalized organizations with a "chief engineer" at the head of each who reports to an administrative official generally appointed politically.

Municipal organizations may differ in details, but in general can be classified according to the size of the city. In a small city a common form of organization is the elected mayor and commission type. These officials are seldom technicians, and often select the departments which they desire to hold in the order of the size of their votes. The insertion of a city manager between the commissioners (who then sit as a board of directors) and the balance of the organization is a great improvement. Departmental organization in the smaller cities is generally along functional lines.

In cities of medium size, a widely

used type of organization is that of a mayor and council. The mayor generally has the appointing power of the heads of all departments which are usually divided along activity lines. Beside the usual departments of police, fire, health, welfare, etc., there are usually separate departments of parks, water, street cleaning and disposal, and often a catch-all department of public works. The latter is usually organized with a mixture of functional and activity bureaus.

In the larger cities the separate departmentalization is usually carried still further. Under the new charter for New York City, for instance, besides the usual departments of police, fire, health, education, etc., there are the following more or less related but separately organized departments: City planning; housing and building; docks; water supply, gas and electricity; sanitation; public works; purchase; and parks. This arrangement is largely an outgrowth of historical development and has many illogical characteristics, such as the grouping of gas and electricity supervision with the design, construction and operation of all water supply distribution; it is not evident why docks should be separated from public works and yet bridges are included. Under each department the organization is usually a mixed geographical and functional one; operation for example, being along geographical lines while design and construction are centralized and functionally broken down in various ways.

Technical administrators

Salary studies amply demonstrate that technicians who have become administrators command higher salaries (because of their innate and demonstrated competence) than do other technicians and the average non-technical administrators. This applies specifically to the railroad and industrial fields and to several branches of civil engineering. One reason for this is that the organizations operating under technician administrators are usually more efficient than are those organized differently.

In the field of public works administration lessened efficiency reacts unfavorably upon technical employees and also costs the taxpayers more. Every city engineer, therefore, owes it to himself, to his assistants, and to the taxpayers, to devise his organization so that he is the actual head of all technical engineering affairs in his municipality. He should not be too modest, or too fearful of criticism, in promoting the best interests of the profession, of his department, and of his men.

Several of the national engineering societies have been consistently advocating the appointment of engineers as the executive heads of public works and other technical departments. Local engineering groups could well do likewise; the city engineer should promote such opportunities whenever they offer. By so doing he will raise the standards of the profession, enhance the prestige of the city engineer, give his technical assistants an incentive for increasing their efficiency and, almost inevitably, place himself in a position to secure more adequate financial remuneration.

The merit system

In his efforts to improve the efficiency of his organization the city engineer must carefully consider all phases of the merit system. The civil service as it is now operated is far from being perfect.

Formerly, it was common practice to make extensive changes in technical personnel wherever a change took place in the higher administrative officials through political changes. The resulting loss in departmental efficiency and the higher costs to which the community was subjected led, in many instances, to the promulgation of civil service laws. Under this system employees are hired on the basis of merit and their tenure of office depends theoretically on technical fitness. In addition, such laws often provide indirect compensation elements in the form of vacations with pay, and leave on account of illness—either with full pay, with time charged against vacation allowance, or with guaranteed continued tenure of office after extended absence without pay. In addition, pension systems have been established with voluntary or compulsory contribution on the part both of employees and the city.

The civil service ideal is advantageous both from the point of view of the employee and of the community. However, it lacks one essential element of control, namely, a means to lower the standing of individuals who fail to maintain a definite rating of efficiency. Under all existing civil service laws, so far as the writer knows, the idea of protecting the employee has been carried to such lengths that it is almost impossible to make this logical readjustment. It is highly desirable, especially in the higher grades, that such elasticity be provided and various schemes have been suggested to attain this end. One of these is that every employee should be required to submit to periodic examination, his subsequent rank and salary being dependent at least in part on the outcome of such tests.

Many practical difficulties attend the schemes that have been devised to correct this condition. For instance, experience and familiarity with local conditions are difficult of proper weighting, as are also executive ability and leadership. In the case of the long-time employee, they often become his principal assets.

Salary schedules

The development of a competent personnel staff depends not only on careful initial selection but the establishment of an appropriate salary schedule. The salaries, of course, must be adequate to attract good men and keep them.

There is a definite limitation to the number of men available for top positions, consequently salaries for these jobs should be fitted to meet the requirements of desired men; this is better procedure than restricting the field by the limitations of a fixed salary base. In the lower grades, on the other hand, where competition is keen, it is generally possible to establish salary rates for specific types of positions to which appointments can be made on the basis of competitive examinations.

Personnel work in the larger cities is usually assigned to a group (usually a civil service commission), the duties of which include the preparation of specifications for various positions, the conduct of examinations to prepare eligible lists, and the establishment of proper salaries for such positions. While the formulation of a set of specifications for positions is comparatively easy, the creation of a salary schedule is quite difficult and seldom satisfactory.

Almost invariably, the efficient leader or high-class technician can secure much higher compensation outside public service than the governmental legislators who control the purse strings have been willing to pay. This usually has limited the field of selection and resulted in the employment of less valuable leaders, thereby reducing the efficiency of the organization and increasing the cost to the taxpayers for the work done.

The number and variety of the classifications of salary systems which have been promulgated throughout the country shows, through their diversity, that no single universal system can probably be devised. It is rarely possible to adapt even the most carefully prepared schedule to a locality other than that for which it was developed. Wide variations are logical, however, because salaries must be adjusted to living and other local conditions.

Titles play a role

One of the minor problems connected with the creation of a satisfied organization, although a very essential one, is the establishment of a proper system of titles. The designation, "city engineer," and also "chief engineer" has a social value of importance.

Custom and courtesy have largely dictated that the technician of highest rank and salary should be designated the chief engineer. This is true whether he is the head of an organization which might advantageously include seven or more distinct grades, or whether he is the head of a small group which normally would include as few as three titles—such as chief engineer, assistant engineer, and junior engineer. Gradations must obviously exist between large and small organizations to include those of all intermediate sizes.

Were it not for the fact that the duties of the chief technician must include executive and administrative activities as well as technical ones, the chief technician in a small organization would normally rank with men with titles of engineer, senior engineer, or division engineer in a large group. Even in the smallest organizations, somewhat similar conditions exist with reference to men in the lowest grade—such a man often being called upon to do both subprofessional and lowest grade professional work. Under such circumstances he should normally be given the title which corresponds with the highest grade of work done by him. Intermediate positions in organizations of slightly larger size would be spread correspondingly. These conditions are illustrated in the diagram annexed (Fig. 4). The titles used are purely illustrative.

Some practical hints

An engineer executive would naturally arrange his organization so that each man knows his immediate superior and that a clear cut line of responsibility will exist from each man of every rank and position through to the chief executive. He will develop a merit system where none exists, and endeavor to improve any existing system by the formulation of sound position specifications, experience requirements, and salary rates for his department. He will select his personnel accordingly and see that they maintain their required efficiency by some method of periodic work evaluation, with promotion in salary and rank based largely thereon. He will devote a suitable share of time to advance planning, his budget will be scientifically prepared and carefully maintained.

He will be enough of a politician to keep his organization out of politics, and his every action will be directed solely toward the good of the community. He will not be jealous of his prerogatives or selfishly overanxious to hold his present circumscribed status or job. He will know his natural limitations and those of the individual members of his organization and will appreciate that neither he nor they can "know it all." He will seek, and as far as possible secure, the best available technical consulting engineering advice on each new problem, and also use this service as a means of checking up on his organization periodically to see that it is keeping up to date.

By doing all these things the city engineer will merit and eventually secure the higher compensation to which he and his organization will be entitled, and at the same time he will engender a higher respect for the profession which he represents.

Modernization of Assessment Procedure

SAVING money in the long run and providing for more just tax assessments for citizens are the objectives of a number of American cities that are modernizing their assessing systems. Fort Worth, Tex., according to the *Assessors' News Letter*, bulletin of the National Association of Assessing Officers, is one city in which a complete reappraisal of property is underway and modern assessing methods have been installed. This "modernization" includes new land maps for the entire city, a complete set of new land and building card records, and the preparation of a building manual. About 60,000 parcels of land will be reappraised in the survey, at a cost to the city of about 25c. per parcel.

In Washington, D. C., a Commissioners Special Committee on Tax Delinquency, recommending improvements after a survey, has advised for the assessor's office a complete modernization and mechanization of the work, reduction of the tax review period from six months to three, discontinuance of the tax rolls by substitution of a modernized card record, and preparation of tax bills in a central billing office.

Among other cities which, during the past year, reported improvements in assessing methods are Chicago and San Francisco, both of which made machine installations; Yuma, Ariz., Bridgeport, Conn., Orlando and West Palm Beach, Fla.; Benton Harbor and Flint, Mich.; Greensboro, N.C., and Dallas, Tex.

"The initial expense of modernizing an assessment office may seem high but experience shows that in practically all cases where the work is done, the cost is more than justified by immediate and ultimate benefits that follow," says Albert W. Noonan, technical director of the National Association of Assessing Officers. "An increase in taxable property, better distribution of the tax burden, and a more accurate portrayal of the city's resources are the usual benefits which accrue."

Mr. Noonan cites the case of Bakersfield, Calif., where Assessor Dean R. Hurley reports that for the past five years there have been only two protests made by taxpayers against the assessments placed against them. Both of these occurred in 1935. The assessor attributes the unusual non-protest record to the modern system installed in 1932. Even though this resulted in a 26 per cent increase in assessed valuation, the equality of the values established was so satisfactory that not one protest was made that year.

Cities are Enlarging Their Personnel

JOBS are on the increase in municipal governments, and salaries are going up. A total of 32,188 people found new jobs in 794 city governments last year, according to statistics gathered for *The Municipal Year Book 1937*, issued on April 20 by the International City Managers' Association. There were 0.5 per cent more employees per 1,000 people in 1936 than in 1935.

The real indication of a marked expansion of opportunities for municipal employment in cities of all population groups, according to *The Year Book*, is the ratio of new appointments to full-time employees. For all cities over 10,000 population, this ratio jumped from 5.7 to 7.0 last year. It varied directly with the size of the city, suggesting that greater employment opportunities lie in the service of the larger cities.

Reports on expenditures for salaries and wages in 1936 for all full-time and part-time employees, indicate that the average salary for 496,958 employees in 781 cities was $1,765. When compared with figures for 1934, the average annual salary in cities over 500,000 and in cities between 30,000 and 100,000 has increased almost $200, and in cities between 100,000 and 200,000, about $150. In cities between 200,000 and 500,000, however, the average has decreased $64.

The average number of municipal employees per 1,000 people in 1936 was 9.9. The employee figures verify a tendency noted in previous years that the number of employees per thousand increases with the size of the city. Cities over 500,000, for example, hired 12.6 employees per thousand and those from 200,000 to 500,000, over 10. Those from 100,000 to 200,000 employed 8.6; from 30,000 to 100,000, 7.8, and from 10,000 to 30,000, 6.6.

ENGINEERING NEWS-RECORD

Volume 118, No. 16.

Copyright, 1937, by McGraw-Hill Publishing Company, Inc.

EDITOR—F. E. Schmitt. EDITORIAL STAFF—V. T. Boughton, N. A. Bowers, W. G. Bowman, W. W. DeBerard, C. S. Hill, H. W. Richardson, E. J. Cleary

Editorial offices at 330 West 42nd Street, New York

April 29, 1937

Supercities of Tomorrow

CITIES ARE GROWING AGAIN, following depression dormancy, but their new growth is not likely to be measured solely or mainly in area or population. Its true measure will be their progress in development of existing facilities to serve present and future needs more effectively. The city of 1950 is likely to differ materially from that of 1930; if present objectives and the revealing experiences of the depression period are not forgotten we will trend toward a truer kind of supercity than in the past. Enlightened civic sentiment and intelligently informed public officials should be an effective check against random expansion, incongruous development, and internal decay. Prior to 1930 much city growth was illusion; cities grew in size by outskirt-fringe development, largely at the cost of depopulation of central areas and the creation of slums through physical and social obsolescence. Present standards and objectives are aimed toward correcting the evils of this fictitious growth, and if they are made effective the supercity of the future will be sound, useful and livable rather than merely large.

The World Gets Smaller

PROGRESS IN AIRPLANE DESIGN has gone on at rapid pace of late. Successive advances crowding one on the other have reduced distance at an unprecedented rate, and the process continues. Just now several items in the quickly changing record of aviation superlatives appear almost simultaneously. "Trip 100" of the service between Honolulu and San Francisco was completed April 21, thus far with a 100 per cent safety record. The same day marked the takeoff from San Francisco of the first regular mail flight to China, an 8,700-mile trip over an all-water route. Third, a transcontinental system has just announced a regular daily schedule of 15¼ hours between San Francisco and New York. A bombing plane for Army use larger than the "flying fortress" is nearing completion. And finally, orders have been placed for six three-deck flying boats, each equipped to carry 80 passengers on long flights. These events are but indications of what is yet to come. Already the speedier transit between far-distant places is bringing about new conditions and new opportunities. Internal as well as international relationships are certain to be affected by this speeding up of interchange, as they have been affected by every prior advance in transportation, and we must adjust our ideas to what is, in effect, a smaller world.

Cut Relief Activity

ECONOMY IS BEING TAKEN SERIOUSLY in Washington, for the first time in some years. Proposal by some Congressmen of a flat ten per cent cut in all government appropriations gives a hint of the earnestness with which reduction in expenditure is being sought. The largest single economy could be made more easily, however—by ending or drastically cutting the relief activities of PWA and WPA. This step at the same time would work powerfully for reemployment by clearing the way for recovery of the country's lagging construction industry. The PWA, which served a useful emergency purpose, should not be perpetuated, to become a tool of the politicians, which development already appears to have gone a long way. A definite date for ending its construction activities should be set, so that the men now employed in it can secure new connections. The Hopkins WPA system may in part have to be maintained, if for no other reason because its administrator still is riding the crest of the wave. But those of its activities that go far outside its original objectives should be cut off at once. If the WPA were so curtailed the work of building schools, hospitals and the like would be returned to normal agencies, and thereby a large field of activity that has been disorganized by WPA interference would be given opportunity to recover. In this process, also, a large number of workers would be taken off the relief rolls, which would help to answer the question of how much money really is needed for relief.

A Closer Tie

SURETYSHIP PLAYS AN IMPORTANT PART in construction, though its function and limitations are all too often misunderstood. A surety bond is merely an instrument of insurance that, within certain limitations, the job will be carried through to completion. It does not, as many owners would believe, make a good contractor out of an incompetent one; neither is it a release of the contractor from moral and legal responsibility, as some contractors would like to believe. Suretyship if sound does, however, promote sound construction, which is important to everyone. Misconception of suretyship is therefore against the interests of all the parties concerned, and fortunately much of the existing misconception can be dispelled by a closer tie between the three parties—the bonding company, the owner or awarding authority, and contractor, who have a common interest in the successful completion of the job. To effect this tie the Bureau of Contract Information has just undertaken to promote better understanding of the place of suretyship in construction. All three parties can be served by this new effort. The owner can be educated to the value of surety protection as a guarantee of completion of work within stipulated time and price; contractors can be shown that sound surety buying is an element in the development of better contracting conditions; the sureties themselves will learn much through a better understanding of both the contractor's and the owner's problems. Properly conducted, the Bureau's promotion program will make for better construction relations all around.

Telltales for Water Quality

SAFEGUARDING SAFETY by telltale warnings has become recognized as an essential of good practice. Railways provide track circuits to give an automatic danger signal when a rail is broken; electric feeder systems have monitor systems that warn instantly of abnormal conditions even though the systems are built to have inherent safety against all foreseeable intereferences. The automatic warning given by such supervisory devices is most valuable precisely where risks are smallest, for it is here that danger, when it comes is most unexpected. The latter conditions are those of water supplies, whose safety

has been developed to a high point by scientific water technology but which nevertheless are subject to occasional derangement. Because water systems are exceedingly safe, the effect of a derangement, as for example the recent one at Dallas, is to take officials as well as consumers unawares. Often the results are severe—an epidemic of illness that attacks hundreds or thousands and may have a substantial death list in its train. Can water operation be monitored like railway or electric operation? If either "manual" or automatic monitoring is possible, the early warning of unsafety would probably enable users to adopt protective measures. It is true that contamination of the supply could never be detected before its effects had reached at least some consumers, but even so the issuance of warning within a few hours would be a large advance over the usual conditions, under which the first knowledge of contamination is given by the epidemic itself. Therefore, regardless of how well a water supply is safeguarded, the added protection of a telltale warning system might be a paying investment.

Revolt Brewing

MOTOR VEHICLE TAX DIVERSION has in the last few weeks come into current news in a new aspect. The news is that legislatures are refusing to extend or continue diversion. In New York the Governor's request to continue the extra one cent gasoline tax for general purposes is being opposed by the legislature. Even New Jersey, which played ducks and drakes with road tax money all through the depression, has surprised everyone by a senate reformation that almost sustained the Governor's veto of this year's diversion bill. And in other states legislators are turning apprehensive ears to the rumblings of discontent from road users and are thinking cautiously about further peculations.

That the objection is to diversion and not to more taxes also finds confirmation in the news dispatches. Tax increases are proposed in Missouri and in Minnesota and are likely to be made statutory without much opposition. But in both of these states fundamental law denies the use of motor-vehicle taxes to any purpose except highway improvement; the people are willing to be taxed more if they are confident that they will get more and better roads. And this feeling is getting back to Washington.

For nearly a quarter-century the federal government has been a liberal contributor to roadbuilding. Through federal aid Congress has sought to ensure needed road improvement faster than the states could provide it by their own money alone. This wise and generous effort was nullified when states, the best and richest of them, began to divert their road funds—often to an amount far in excess of the money contributed to them by Congress. Dishonesty to the road taxpayer was matched by dishonesty to their federal benefactor. No wonder that this benefactor is now losing patience, as the news dispatches are also recording.

A few weeks ago Maryland and later Georgia and New Jersey were called onto the carpet to explain why they should not be penalized for diversion by withholding a part of federal aid. More important even than this tardy enforcement of law, the strongest sponsors of federal aid in Congress are beginning to advise rigid punitive legislation, to the extent of denying all federal aid to states that divert their road funds. Thus, revolt is developing on a wide front. The danger now is that when it matures it may turn against roadbuilding instead of against dishonest politicians.

Fragments of a Policy

IF BUILDING COSTS are too high, there will be no building. If building costs can be kept low, either by greater efficiency or by trimming profit margins, increased volume of construction will increase total profits or spread profitable business over a longer period or both. Few persons question the validity of this economic principle, but fewer still honor it with practice. On the contrary, both labor and management pile on all the traffic will bear in the way of increased prices, just as soon as the business cycle turns upward. It has been so after every depression. It is so today; which makes recent happenings of interest:

(1) Carnegie-Illinois Steel Corp. has announced it will not increase prices for the third quarter of the year. The steel industry was too prompt in passing its last wage increases on to the public, with the result that considerable unfavorable publicity was generated. Since that increase in price seemed to foreshadow further increases, the mills were swamped with orders, taxing their capacity. Either or both of these situations may have fostered the latest decision, rather than a desire to keep prices down and thus help to stabilize demand and increase total profits, but the fact remains that the "no-price-increase" action should tend to do both.

(2) The Aluminum Company of America has announced that it will not raise prices in spite of increased costs. Its avowed purpose is to aid orderly recovery in line with the principle stated above. No philanthropy, however, is involved, since aluminum thus improves its competitive position with high-priced copper.

(3) Last week, union building labor in New York City agreed to a program that would be epochmaking if generally followed: At the beginning of a job, wage rates for that job would be fixed, to remain unchanged until the job is finished, and no strikes would be permitted. No betaer prescription for prosperity has been written than that. Unfortunately, the agreement applies only to low-cost housing, when and if a federal-aid bill is passed. Contingent though it is, the agreement nevertheless deserves wide commendation.

(4) Less spectacular but more solid than the New York labor agreement is the action of Valparaiso, Ind., carpenters, who reduced their own wages from $1.50 to $1.1½ per hour with the sole purpose of stimulating building activity in the city. Based on the unquestioned fact that yearly wages are not high enough, union labor has always sought to increase them by boosting hourly wages. But hourly wages increase building costs, which decreases building, which soon results in no wages at all. By reducing hourly wages the Valparaiso carpenters seek to reverse this devastating process.

In these four developments may be seen fragments of a policy which, if followed, would do more for the building industry and for business generally than any amount of government stimulation of public works. At this point in the business cycle, when demand for building is strong, well-founded and growing, we have reached the time to put such a policy into effect. The alternative is the familiar story of boom and bust.

CURRENT NEWS

Heavy Rains Cause Flash Floods

Streams in eastern seaboard and Upper Ohio watershed overflow banks, resulting in considerable damage

Heavy rainfall on April 26 and 27, with maximums exceeding 5 in. per day at some points, resulted in unusually heavy streamflow in the Atlantic coastal region from South Carolina to Maryland, extending westward to the headwaters of the Ohio. In the Carolinas streams were generally slightly above flood stages, the extent increasing to the northward. Flood stage was exceeded by 11 ft. on the Roanoke River at Weldon, N. C., and by 13 ft. on the James River at Richmond, Va. Crests along the Potomac, as compared with the record flood of March, 1936, were lower by 4½ ft. at Cumberland, Md., 6½ ft. at Harpers Ferry, W. Va., and 3 ft. at Washington.

The Potomac Valley

Waters from swollen Wills Creek reached the business section of Cumberland, then receded suddenly while merchants, recalling the disastrous flood of a year ago, were busy removing stocks to safe quarters. A temporary bridge span across the Potomac at Hancock, Md., was washed out, cutting off traffic between Maryland and West Virginia in this area. Railroads and highways in the upper Potomac valley were blocked by high water for two days. Four lives are reported to have been lost when a highway bridge over the Robinson River at Orange, Va., was swept away, carrying a car into the stream. Potomac Park in Washington, D. C., was flooded when high waters topped the wall along the Potomac River.

Upper Ohio Valley

On the western slope of the Allegheny Mountains floods caused considerable concern in Johnstown, Latrobe, Connellsville and Pittsburgh, Pa., Wheeling, W. Va., and Martins Ferry, Ohio. Further down the Ohio the flood tapered off rapidly. Pittsburgh received its third innundation in thirteen months when a crest of 35.1 ft. was reached early on April 27, 10 ft. above flood stage and sufficient to flood the lower end of the business district triangle in the vicinity of the Point. Johnstown received a scare when Stoney Creek and Conemaugh River both rose rapidly to flood the lower business district, but a cessation of rain in the mountains to the east dropped the streams back into their channels. The Franklin Street footbridge over Stoney Creek was washed away.

Wheeling Island, Wheeling's vulnerable residential district of 10,000 population, was menaced by a river level 8 ft. above flood stage. Though the rise has stopped at this level, according to late reports, there is a possibility of a flood 4 ft. higher, and many residents are reported to be evacuating their homes for the second time this year. On the Ohio side of the river, at Martins Ferry high water caused the mills of Wheeling Steel Corp. and Carnegie-Illinois Steel Co. to shut down.

London, Ont., flooded

Residents of London, Ont., fled from their homes as waters of the Thames River rose 30 ft. above normal and swept through the town on April 26. Other towns in the vicinity are reported to be in trouble as unceasing rains swell every local stream. A Chicago-Montreal express train was wrecked near Woodstock, Ont., by a washout, killing three persons.

Bascule Counterweight Falls On Winnipeg Bridge

Without warning and apparently without previous indication of weakness, the concrete counterweight over the south leaf of the Osborne St. bascule bridge across the Assiniboine River in Winnipeg, Man., Canada, fell to the roadway on April 19. The accident, occurring at 3 a.m. was unwitnessed. Built in 1913, the bridge, a Strauss double leaf-bascule of vertical overhead-counterweight type, 112½ ft. between trunnions, had not been operated during its 24-year life.

According to telegraphic advice from W. P. Brereton, city engineer of Winnipeg, the concrete counterweight block, supported 20 ft. above the roadway, was 49 ft. long, 7½ ft. wide and 12 ft. deep, and contained two pockets for balancing weights. The block was supported on two columns connected to a structural steel truss embedded in the counterweight concrete. The columns consisted of two channels and cover plates, the cover plates stopping off at the bottom of the concrete while the channels extended to the top. The chords of the counterweight truss each consisted of two 15-in. channels.

The wreckage found after the accident showed the concrete block broken roughly in a vertical plane 3 ft. west of the centerline. The east half landed on the bridge truss 7 ft. above the floor after moving several feet east in falling. The west part lay on its north face, the west end toward the northeast. The south channel of the bottom chord of the counterweight truss exhibited a sharp transverse break without apparent elongation while its companion channel broke after distortion. The channels of the top chord were twisted but not broken. Although test specimens indicate that the concrete of the counterweight is of low strength, Mr. Brereton states that this strength is ample for the stress carried. Tests of the steel show good strength and elongation.

The bridge will be closed for some weeks while repairs are being made. Whether these repairs will take the form of a new south counterweight or the removal of the present north counterweight and the conversion of the movable bridge into a fixed span has not been determined. The second plan was being considered before the failure.

Aluminum Monopoly Charges Filed

Department of Justice charges Aluminum Co. of America with maintaining a monopoly of aluminum production

Charging monopolistic practices in violation of the Sherman Anti-trust Act, the Department of Justice on April 23 entered suit against the Aluminum Company of America, its subsidiary and associated companies, and numerous directors and officers, and asked the court to enjoin the practices complained of and to dissolve the company into several independent and competing organizations. The suit was entered in the U. S. District Court for the Southern District of New York.

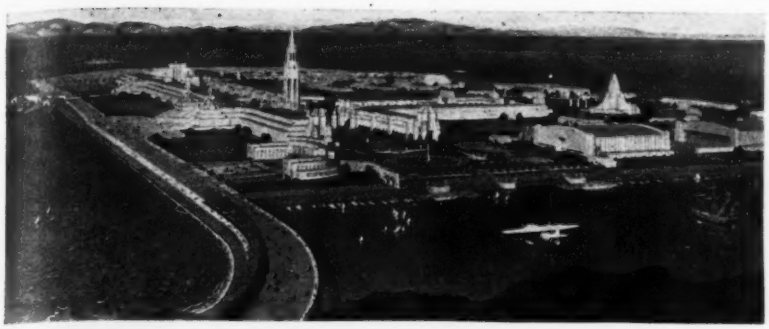
The Government alleges that the Aluminum Company, utilizing such devices as subsidiary and controlled companies and interlocking directorates, both in the United States and elsewhere, has eliminated competition to such an extent that it can dictate prices arbitrarily. This control, it is charged, is evidenced by the company's control of 90 per cent of the bauxite deposits in this country, its utilization of 100 per cent of the bauxite produced, and its production and sale of the following: 85 per cent of the virgin and scrap aluminum produced and imported in the United States; 90 per cent of the aluminum sheets; 95 per cent of the "hard" aluminum alloys; and virtually all of the extruded shapes, wire, cable, bars, rods and tubing of aluminum or its alloys which are used in this country.

Foreign agreements

Abroad, the complaint alleges, the company has entered into agreements with all other major aluminum producers except Russia, which does not export such products, having the effect of reserving the American market to itself and of dividing other markets in a manner which eliminates the influence of competition upon prices. The American company, through its corporate connections, is said to have had either complete or substantial control of bauxite-producing areas in British and Dutch Guiana, Jugo-Slavia, France, and Italy, and of manufacturing facilities in Norway, France, Italy and Spain.

It is also charged that the company has entered into contracts with the Niagara Falls Power Company and the Shawinigan Water & Power Company by which the latter are restrained from serving any possible competitor with power, and that it acquired potential power sites from the Duke interest far more than its legitimate needs, and at inflated prices, for the purpose of discouraging competition.

The government also attacks the recent price rise announced by the Aluminum Company as arbitrary and unnecessary, since its earnings have increased from 55c. per share of common stock in 1935 to $8.65 in 1936.



Clyde Sunderland Photo

FILLING GOLDEN GATE FAIR GROUNDS

THE SITE of the 1939 Golden Gate International Exposition is shown as it appeared recently from an airplane and as it will appear when completed. The site is a dredge fill in San Francisco Bay just north of Yerba Buena island, whose northerly tip appears in the foreground of the air view. A six-lane causeway, as may be seen, is to connect the fill and Yerba Buena Island. The two steel structures in the right center of the airview have end openings 200 ft. wide; unlike most of the exposition structures these are permanent buildings and will be re-equipped as hangars when the exposition is over and the site is converted into a municipal airport. Also permanent is the administration building, on which first foundation work may be seen in the air view, which will become a terminal for the airport.

Ferry slips appear in the left background. Filling is still in progress at the far end of the site. The fill, which is to be finished before Aug. 1, 1937, was about 85 per cent complete on April 20. Ponds on the nearer half of the fill are rain water, not sea water. A description of the dredging operations was published in *ENR* March 18, 1937, p. 412.

Vinson Stream Pollution Bill Passed by the House

The House of Representatives on Apr. 21 passed the Vinson stream pollution bill, which calls for an annual authorization of $1,000,000 for survey work in addition to $700,000 a year for ten years to be allotted to the states for expenses.

Included in the authorization of the measure is the sum of $300,000 annually for expenses of establishing and maintaining a division of water pollution control under the supervision of the U. S. Public Health Service. This division, under the measure, would make intensive surveys of stream pollution throughout the country, for report to Congress.

The bill has still to pass the Senate.

New Jersey Diversion Veto Overruled by Legislature

Governor Hoffman's veto of the New Jersey law to divert $7,918,000 of highway funds to purposes of unemployment relief was overruled by the state legislature on April 27.

Simultaneously, the governor announced that he had been informed by the U. S. Bureau of Public Roads that a one-third deduction, amounting to $1,132,000, in the state's federal aid highway money would be enforced if the bill were put through.

A penalty was recently ordered against the state of Maryland for tax diversion, and the state thereupon repealed a proposed diversion of its gas tax (*ENR*, April 15, 1937, p. 571).

New York Approves Silicosis Code

Rock drill dust control now mandatory under regulations adopted by industrial commission

Control of dust caused by drilling in silica rock will be mandatory in New York state after May 1, when rules and regulations promulgated by the state industrial commission, as authorized by the amended silicosis compensation act passed by the legislature last June, go into effect. The act, which makes silicosis compensable as an occupational disease and requires the use of dust-control methods or devices on rock drilling where silica dust is created, has been inoperative pending formation of the industrial code governing its administration. Industrial commissioner Elmer F. Andrews appointed an advisory committee last summer to work with members of the commission in drawing up the code. The code was ready three months ago, but objections raised at a public hearing sent it back to the medical subcommittee for revision.

The revised code, as adopted, sets up two standards of permissable dustiness. Dust from a "fairly uniform" rock containing less than 10 per cent free silica is considered injurious in excess of 100,000,000 particles per cu. ft. of air. From rock containing 10 or more per cent free silica, or from formations, natural and synthetic, having a variable and unpredictable content of silica, the safe limit of dustiness is set at 10,000,000 particles per cu. ft. of air. The size of the dust particles is not mentioned in connection with their count.

The act also provides that the industrial commissioner must approve the method or apparatus to be used for dust control. Last November three makes of the vacuum type of control devices were tested at an outdoor laboratory at Letchworth Village. The industrial board will announce formal approval of accepted devices on April 29.

—◇—

Over Four Hundred Engineers At A.S.C.E. Meeting

Four hundred members of the American Society of Civil Engineers and more than two hundred guests gathered in San Antonio, Texas, April 21-24, for the spring meeting of the society. Though the large majority of those in attendance came from the Southwest, there were many from other parts of the country, 35 of the 58 local sections being represented at the local session conference held in advance of the main meeting.

Technical sessions were devoted largely to matters of local interest. Resources of the State of Texas were reviewed at the opening session in a group of papers by authorities in several fields. At the division meeting attention was centered on special highway problems of Texas, on irrigation matters of peculiar interest to the Southwest, on the engineering work of the International Boundary Commission, and on construction of the new Galveston causeway and the San Jacinto memorial tower. Extracts from some of the papers will be given in a subsequent issue.

Diarrhea Epidemic In Dallas

Polluted water supply causes 3,000 cases of dysentery in Dallas suburb but typhoid danger appears past

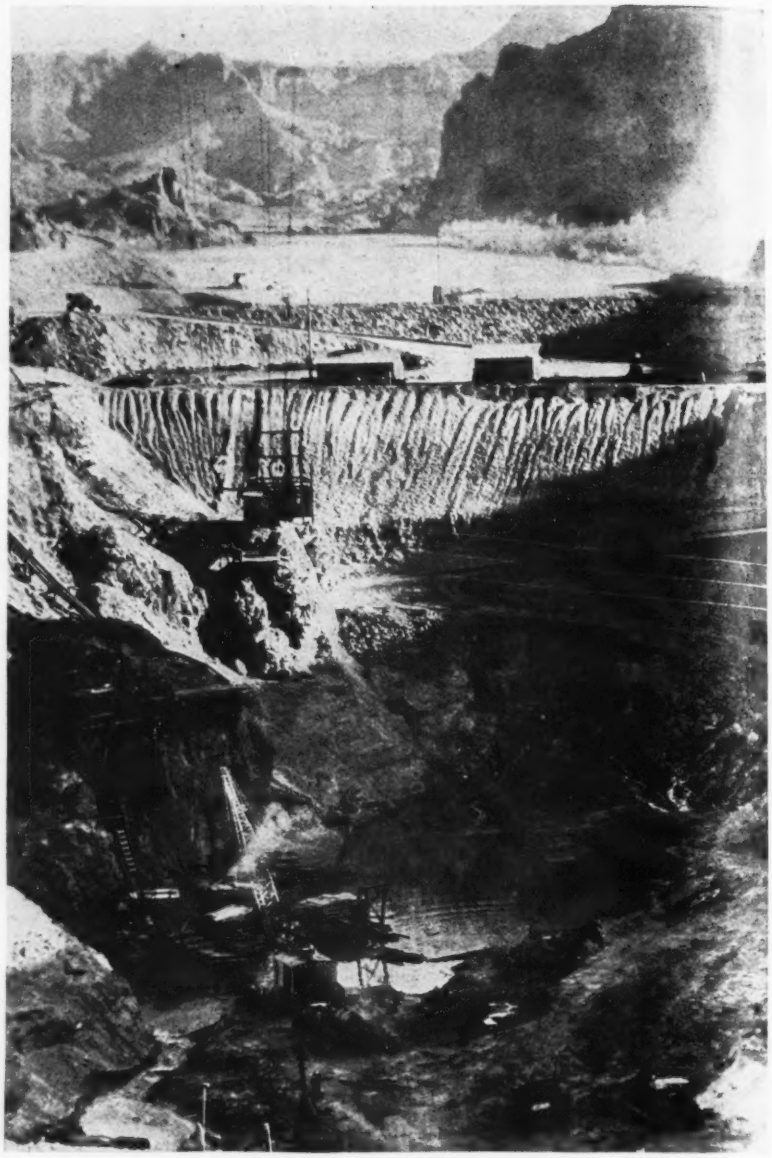
About 3,000 residents of the Oak Cliff section of Dallas, Texas, a large proportion of them children, were stricken with diarrhea between April 8 and April 14. All the cases occurred among a population of about 10,000 served by one water main.

Laboratory tests indicate that the epidemic was due to a strain of dysentery, organisms of which have been recovered from the supply-main water and from the stool of the patients. A noteworthy characteristic of the water samples was that they almost invariably showed much gas with low bacterial count, and practically all samples gave positive presumptive tests within 8 to 12 hours.

The source of contamination has not been located, but the city has employed nurses to survey cases and plumbers to inspect the plumbing in this locality. As soon as the contamination was discovered in the water, the health department of Dallas conducted a wholesale immunization campaign against typhoid fever; about 9000 persons were immunized. J. W. Bass, director of public health at Dallas, stated, "We believe that the danger of a typhoid fever epidemic has passed, because no typhoid or suspected typhoid has been reported to date."

The supply in the Oak Cliff section is artesian water, coming from the wells at a temperature of 108 degrees. It contains about 1000 parts of dissolved solids and has never been chlorinated. The water for Dallas proper comes from surface sources and is chlorinated.

Since the discovery of the contamination the water has been treated with a heavy dosage of chlorine. Hypochlorite was used at first as an emergency measure, and chlorinators were ordered by fast express and installed April 20. It required about four or five days to destroy the organisms completely. The trouble experienced getting chlorine into the main was believed to be due in large part to the use of large mains for fire protection with very little consumption.



PROGRESS ON PARKER DAM

PARKER DAM SITE excavation had progressed to a level 128 ft. below the elevation of normal water surface in the river when these pictures were taken early in April. At that time an average of 27 sec.-ft. was being pumped from the excavation; of this inflow 75 per cent was from the downstream side. Maximum depth is to be 250 ft. below normal water surface. Common excavation on the main dam had amounted to 1,000,100 cu.yd. on April 3 and rock excavation had totaled 42,000 cu.yd. The picture was taken from the top of the upstream cofferdam looking south, or downstream. Truck roads still are maintained from the excavation on both of the cofferdams.

Parker Dam, on the Colorado River, will divert water into the 392 Colorado aqueduct.

Arkansas Commission Appointed To Control Floods

Governor Bailey of Arkansas has appointed a State flood control commission under the terms of an act passed by the 1937 session of the legislature. The commission is empowered to study and determine upon a sound public policy with regard to flood prevention and protection; to compile figures on flood damage and collect information and data on rainfall, channels, stream obstructions, existing facilities for storing surplus water and existing protection works, and other data affecting the flood situation.

The commission is authorized to cooperate with the War Department on behalf of the State on flood control work in Arkansas. It will make application for allotments or assistance from the federal government and will enter into necessary contracts. It has the right to receive any federal grants or loans for projects within the State on behalf of the State and to use such funds.

The commission, moreover, has power to widen, deepen, straighten, divert or eliminate the course of any stream and may construct dikes or levees to protect property from floods and may acquire lands necessary for such purposes. It is, however, forbidden to interfere in any manner with "any levee or drainage district now existing or hereafter organized." The commission is given no authority over any land included in such districts.

The six-member commission includes one member from each congressional district in the State. The members appointed are: R. E. Overman, A. G. Spelling, John P. Morrow, Layton Coffman, T. L. Green, Lamar Willimason, and M. W. Greeson. Members of the commission serve without pay but may appoint paid assistants.

No Accidents from Skidding On New Bridge Pavement

Erroneous reports of a fatal skid accident on the new concrete deck of the Queensborough Bridge, New York City, are answered by F. J. H. Kracke, the city's commissioner of Plant and Structures, by the definite statement that no skid accidents have occurred on the concrete deck since it was placed. Skid accidents occurred in very great number on the wood-block pavement with which the bridge was equipped until the present repaving was begun a year and a half ago. The new paving has been completed on the full length of the approaches, the anchor arms, and the island span, for about eight months, and at present three of the five lanes of the two channel spans also have the new decking, with two lanes still to be completed. The high accident rate of the wood-block period has been greatly reduced by the new work, and accidents that now occur are mainly caused by too close spacing of cars for their speed. Accidents due to interference between east and westbound traffic are infrequent.

The fatal accident that occurred just before midnight of April 14 was reported in press accounts as due to skidding on the concrete. The actual fact, given by Samuel Hamburger, engineer in charge of the bridge, is that the accident occurred 264 ft. east of the east end of the concrete deck, on granite-block pavement on solid fill approach. The pavement was dry at the time. Two young men who had just bought an old car were crossing the bridge at what eyewitnesses report as a very high rate of speed, and apparently tried to make a right turn off the approach roadway between elevated railway columns at the wrong point, with the result that the car slid sideways on the granite-block surface into a column and broke in two, killing the two occupants.

Bill for New Quebec Railroad Passes Legislature

The bill granting a charter to the Quebec Goldfields Transport Co. for construction of a new railroad line from Mt. Laurier to Amos in the new mining field of northwestern Quebec (*ENR*, Apr. 22, 1937, p. 608) has been passed by the legislative assembly of the province of Quebec. The only change was in the name of the promoting company, which the assembly insisted must be bilingual. The new name of the company is therefore "The Quebec Northwestern Railroad Company," which can easily be rendered in French and is more satisfactory to the French-Canadian population.

The legislative railway committee has reported favorably a bill permitting construction of a new line from the end of track of the Canadian Pacific R.R. at Angliers to the Abitibi district, terminating at Senneterre, on the Canadian National Ry. transcontinental line. This line is being promoted by the Temiskaming and Abitibi Railway Co.

Both of these proposals for new lines were pending last year but were held up by the fall of the Taschereau government of Quebec.

FHA Will Guarantee Loans In Disaster Areas

President Roosevelt on April 23 signed a bill authorizing the Federal Housing Administration to guarantee modernization loans in the flooded sections of the Ohio River valley and in such other sections as may be visited by disaster before the end of 1939. The regular loan-guarantee powers of the FHA expired April 1 of this year.

The disaster loans will be made by local banks to cover the restoration, rehabilitation, rebuilding, and replacement of buildings, machinery and equipment damaged or destroyed by the recent floods. Federal liability, in cases of default, will be limited to 20 per cent of the total amount of such loans made by each institution, and the total for all loans cannot exceed $100,000,000, including obligations incurred during the past under the provisions of the modernization program. The net total liability that can now be incurred is estimated by FHA at about $75,000,000.

Merger of the Federal Housing Administration and the Home Owners Loan Corporation has been recommended as an economy measure by Senator Byrd. The Senator believes that such a move would result in an annual saving of about $24,500,000. He stated that he would introduce a bill into the Senate this week calling for such a merger.

Pasadena Building Code Changed To Permit Use of Brick

An amendment to the Pasadena, Calif., building code liberalizing regulations governing the use of brick in one and two-story residential construction has been approved by the city board of directors. Regulations virtually prohibiting brick construction were adopted by the city after the Long Beach earthquake. Under the new amendment brick will be permissable if reinforced and if the center voids are grouted. The use of hollow tile and adobe bricks is not included in the amendment to the code.

Use of brick in commercial construction is to be studied by a committee which is expected to file its recommendations next September.

N. Y. Power Authority Urges St. Lawrence Development

Within a decade New York State will be faced with a serious shortage of cheap power unless the power resources of the St. Lawrence and Niagara Rivers are fully developed at once, according to the annual report filed April 23 by the Power Authority of the State of New York. It is stated that if these rivers are not developed, it will be necessary to develop the power by steam plants at an annual excess of cost over hydro-electric development of at least $27,000,000 a year.

The report added that interest in development of navigation in the St. Lawrence would continue to increase with the rise of grain exports.

Performance Bonds Required in N. Y.

Bill passed by legislature would require contractor's bonds on all public works in the state

Mandatory filing of performance bonds and labor and material bonds on all public improvement contracts awarded by the state of New York or any city, county, town, or village in the state, is provided for in a measure which has been passed by both houses of the state legislature and sent to Governor Lehman for action. The bill, if approved by the Governor, would automatically repeal the so-called Smith Bill, in effect since 1919, which gives contractors on highway work the option of dispensing with bonds under certain conditions. It would also require furnishing of additional bonds guaranteeing payment of labor and material obligations on highway work as well as on all other forms of public improvement and thus would eliminate the necessity for invoking present lien laws in connection with such obligations. The bill does not, however, provide for repeal of any sections of the lien laws affecting labor or material obligations.

Opposition to the bill

Vigorous opposition to final approval of the bill has been registered by the state department of public works and by the city of New York. The bill was introduced by Assemblyman Ehrlich and Senator McElroy.

Another bill, which has been passed by the Assembly but is still pending in the Senate, would require labor and material bonds from all contractors on state work but would continue in effect the option of highway contractors to dispense with a performance bond in certain instances. This measure, introduced by Assemblyman Reoux, does not affect municipalities. It has been actively supported in the legislature by the New York State Construction Council, representing the material producing interests, and by the surety bond underwriting companies.

Injunction Against Bayonne Terminal Project Denied

The U. S. District Court for the District of Columbia on April 22 refused to grant a preliminary injunction stopping PWA from disbursing funds allocated to the $4,000,000 terminal improvement project at Bayonne, N. J.

The suit was brought by several property owners, who argued that the principal benefit from the project would be reaped by private organizations, and that the withdrawal of the necessary land from the tax rolls would increase their tax bills.

Arguing against the injunction, government attorneys stated that granting of it would cost the government over $200,000 because of certain contracts that must be executed before May 1.

The court ruled that the allocation to Bayonne was within the scope of the Emergency Relief Appropriation Act of 1935 and, as an exercise of proper administrative discretion under that act, was not subject to judicial control.

Washington Highlights

By Paul Wooton

Construction of small storage reservoirs in drought-affected states at a cost not to exceed $50,000 each is provided in a bill, setting aside $500,000 from relief funds for the purpose, which has been reported favorably by the Senate Committee on Irrigation and Reclamation. The bill was introduced by Senator O'Mahoney.

The administration's economy program does not necessarily mean the death knell of the housing bill, the President stated at a recent press conference. It is possible to do something for housing, he said, with existing appropriations for similar purposes. He cited as an example the revolving fund of the PWA, which still contains between $100,000,000 and $150,000,000. It is possible that this money might be used for housing purposes instead of appropriating new money.

A bill providing for an investigation into the feasibility of a power development at Cabinet Gorge, on the Clarks Fork of the Columbia River near the Idaho-Montana line was provided for in a bill which the Senate Committee on Irrigation and Reclamation reported favorably on April 22. The power would be used both for pumping irrigation water on near-by private developments and for industrial purposes. The bill has already been passed by the House. It was amended by the Senate committee so as to appropriate $25,000 from general funds, rather than from the special reclamation fund.

Midtown Hudson Tunnel Named for Lincoln

The Port of New York Authority announced on April 16 that the temporary title of "Midtown Hudson Tunnel" for the new vehicle tunnel under the Hudson River between West 39th St. in Manhattan and Weehawken, N. J., would be changed to the permanent name of "Lincoln Tunnel."

It was felt that the temporary title was causing confusion because construction is now under way on a midtown tunnel under the East River and proposals are being developed for a trans-Manhattan vehicle tunnel through 38th St.

The commissioners of the Port Authority in this action followed their practice, used in naming the George Washington Bridge, of calling interstate vehicle facilities after distinguished Americans.

At the same time, the tunnel approach street under construction by the Port Authority in Manhattan between West 42d St. and West 43d St. east of Tenth Ave. was named Dyer Ave. in honor of the late Gen. George R. Dyer who was a major figure in bringing about the construction both of the Holland Tunnel and the new Lincoln Tunnel.

The tunnel connecting street which the Port Authority will build between West 37th St. and West 42d St. west of Tenth Ave. has been named Galvin Ave. after the late John F. Galvin who served for ten years as a commissioner of the Port Authority and was for several years chairman of the authority.

Local Share in Flood Control Approved by Conference

Flood control and navigation development in relation to general programs for the conservation and utilization of the nation's water resources was the theme of discussion at the 32d annual convention of the National Rivers and Harbors Congress held April 26-27 at Washington.

Throughout the meeting, stress was laid on the need for immediate flood control action to protect life and property, coupled with the assertion that false economy by cutting down expenditures would result in a net loss to the nation. The principle of local participation in cost of flood control programs was accepted, although one committee recommended "liberalization" of present requirements. Also recommended was uniform state legislation on flood control, regional planning by river systems in the solution of flood control and other water problems, protection of flood channels from further encroachment, and the continuation of the army engineers as the agency for flood control works construction. Placing of public works under a separate department is included in current reorganization plans.

In accordance with usual custom, the speakers included not only delegates advocating specific projects, but also many high federal officials, including the Secretaries of War and Commerce, the Chief of Engineers, the Surgeon-General of the Public Health Service, the Commissioner of Reclamation, and the chiefs of the Soil Conservation Service, Land Utilization Division of the Resettlement Administration, Inland Waterways Corporation, Tennessee Valley Authority, Weather Bureau, Biological Survey, and Division of Forest Influence of the Forest Service.

Contract Information Bureau To Promote Surety Relations

The Bureau of Contract Information, of Washington, D. C., has accepted a request from an association of surety companies to act as an independent agency in the promotion of closer relations between the owner or awarding authority, contractors and sureties. In announcing the acceptance, S. M. Williams, president of the Bureau, states: "So much has been accomplished by the Bureau in developing an appreciation of the joint problems and responsibilties of the awarding authorities, the contractors and the sureties, which means favorable public relations between the three groups, that our organization has been charged by the surety companies with the further development of such relations. This is being done in order that the public may receive the greatest benefit from the successful performance of construction contracts through the ultimate elimination of the irresponsible element bidding for construction work."

Basing the promotion program on personal contacts with the various interests, Mr. Williams is leaving next week for a two-month trip through the South, where he will meet with and address numerous groups of awarding officers and public officials, contractors, engineers and surety representatives.

SOCIETY CALENDAR

NATIONAL LIME ASSOCIATION, annual convention, Chicago, Ill., May 11-12.

BUILDING OFFICIALS CONFERENCE OF AMERICA, national convention, Cleveland, Ohio, May 31-June 4.

AMERICAN WATER WORKS ASSOCIATION, annual convention, Buffalo, N. Y., June 7-12.

ENGINEERING INSTITUTE OF CANADA, semi-centennial celebration, Montreal and Ottawa, Canada, week of June 15.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION, annual meeting, Cambridge, Mass., June 28-July 2.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, New York City, June 28-July 2.

AMERICAN WATER WORKS ASSOCIATION, PACIFIC NORTHWEST SECTION, Victoria, B.C., May 20-23.

MARYLAND-DELAWARE WATER & SEWAGE ASSOCIATION, annual conference, Wilmington, Del., May 6-7.

NORTH CAROLINA INDUSTRIAL SAFETY CONFERENCE, Winston-Salem, N. C., May 20-21.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, New York City, May 22.

LICENSE EXAMINATIONS

NEW YORK: Examinations for registration of professional engineers and land surveyors will be given by the New York State Board of Examiners July 6, 7, and 8 at Albany, Buffalo, New York, and Syracuse. It is expected that assignments to these examinations will be limited to candidates who filed their applications before Jan. 1, 1937.

The IOWA ENGINEERING SOCIETY at its annual meeting March 3-4 at Des Moines, Iowa, elected the following officers: president, T. R. Agg, dean of engineering, Iowa State College; vice-president, A. A. Baustian, and R. E. Robertson; secretary-treasurer, J. S. Dodds; directors, H. O. Croft and Q. C. Ayres. The John Dunlap memorial award was presented to R. B. Vaile for his paper "A High Voltage Electrostatic Belt Generator," and the Anson Marston award was presented to John S. Dodds for outstanding service.

Steel Orders Up 9 Per Cent

The first quarter figures on fabricated structural steel, compiled by the American Institute of Steel Construction reveal a 9 per cent gain in orders and a 19 per cent gain in shipments over the first three months of last year. March activity, the best since last July, made the good showing possible. New orders during March totaled 182,049 tons which is a 77.8 per cent of the A.I.S.C. normal, taken as the yearly average for the 1928-1931 period. Unfilled orders total 561,212 tons, which is the largest backlog available for a number of years.

Unlike steel making, steel fabrication capacity has not yet been taxed. Accordingly, the decision of the steel makers to maintain second quarter prices without an increase should be welcome news to the fabricators. More business with no increase in costs should produce more adequate profits. The purchaser of structural steel may also take some satisfaction in the lack of a price increase, although he pays 2.25 c. (Pittsburgh) as against 1.80 c. last year. The *Iron Age* composite finished steel price is 2.60 as against 2.32 cents in 1929.

LARGE TONNAGE OF ALLOY STEEL USED IN LONG DUTCH BRIDGE

THE NEW 2,000 ft. long bridge crossing an arm of the sea at Merdijk on the highway joining Rotterdam, The Hague, and Amsterdam with the south of Holland, is a notable structure. The new highway structure consists of six simple truss spans of 228 ft. each. The width of the roadway is 36 ft. and two 8-ft. sidewalks are cantilevered on either side. About 9,000 tons of steel were required in the construction of the bridge, of which 5,000 tons was of chrome-copper type. The six spans were entirely erected at a nearby shipyard and floated to the site on barges.

The bridge is near a railroad bridge which, when it was built in 1872, was the largest bridge in Europe.

Brief News

THE BUFFALO SEWER AUTHORITY on Apr. 22 awarded seven contracts, totaling $807,000, covering construction of pumping stations and installation of equipment and special work in the sewage disposal plant for the new $15,000,000 sewer system. The bids were about $4,000 less than the engineer's estimate of $813,000.

EXEMPTION of old law tenements in New York City from the requirements of the multiple dwelling law as to number of toilets and fire retarding construction would have been provided by the Doyle bill which was defeated in the New York State Assembly, April 20. The bill had previously been passed by the State Senate.

INSTRUCTION IN HIGHWAY SAFETY and traffic regulation is required in all New York State schools, public and private, by a state law recently signed by the Governor. The new act requires the regents of the University of the State of New York to prescribe suitable courses in these subjects. The commissioner of Education is charged with the enforcement of this law, which becomes effective September 1, 1937.

INJUNCTION against the further transfer of Hetch Hetchy power by the city of San Francisco to the Pacific Gas & Electric Co. is being sought from the U. S. District Court for the northern district of California by the U. S. Department of Justice in an attempt to enforce compliance with the Raker Act, under the terms of which the city and county of San Francisco constructed the Hetch Hetchy water supply power development (*ENR*, April 22, 1937, p. 608).

TAX EXEMPTION of low-cost housing in New York State has been extended for another ten years (until 1947) by a recently enacted amendment to the state housing laws. The new measure provides that bonds and mortgages of companies incorporated for the elimination of insanitary and dangerous housing conditions under the 1930 housing law are instrumentalities of the state and shall be exempt from state taxation. It further provides that any municipality in which a project authorized under the housing law is located may exempt such buildings from local taxation and such municipal exemption will entitle the project to similar exemption from any state taxes.

THE N. Y. MULTIPLE DWELLING Law has been amended, by an act signed recently by Governor Lehman, to provide that the civil and criminal penalties enacted in certain sections of the 1929 multiple dwelling law shall not apply for a period of six months to any person because of failure to comply with such sections in reference to any old law tenement. The bill provides that if the owner of property violating the dwelling law agrees in writing, with the department charged with enforcement of the law, either to change the building or to vacate or demolish it, the department may set a period, not exceeding six months, within which the law will not be enforced.

Two Bridge Authorities Issue Bonds

The Triborough Bridge Authority has issued $53,000,000 of bonds and the Thousand Islands Authority $2,800,000 of bonds.

The Thousand Islands Bridge Authority issue consists of 4½ per cent bridge revenue bonds, the proceeds of which will be used to construct a bridge across the American channel of the St. Lawrence River near Collins Landing in the town of Orleans, N. Y., a bridge across the Canadian channel near Ivy Lea in the county of Leeds, Ont., and a bridge across the International Rift, approaches to such bridges, and incidental expenses in connection therewith. Contracts for construction of the bridges have already been let. There is at present no bridge crossing the St. Lawrence River between Lake Ontario and Cornwall, 100 miles east of the proposed bridge. New York State law prohibits the construction of a vehicle crossing within 30 miles on either side of the Thousand Islands project.

The Triborough Bridge Authority offering consists of $35,000,000 of sinking fund revenue bonds and $18,000,000 of serial revenue bonds; $35,000,000 of the proceeds of the bond issue will be used to retire 4 per cent serial bonds now held by the Reconstruction Finance Corporation. The RFC will take $18,500,000 of sinking fund revenue bonds and $9,500,000 of serial revenue bonds and will also receive $7,000,000 of the cash proceeds of the sale of the remainder of the bonds issued to the public.

The $18,000,000 remaining from the public sale will be applied by the Authority to the cost of construction of the Bronx-Whitestone bridge project.

—◇—

Two Libraries for Maryland U.

The 6,000-volume C. H. Davis library of highway engineering and transportation has been permanently established at the University of Maryland. The library had previously been in the possession of the University on temporary loan. The collection contains a number of rare volumes.

The transportation library of the late Rowland Bibbins has also been acquired by the University of Maryland. It contains more than 2000 volumes, dealing mostly with urban transportation.

—◇—

Personals

WILBUR A. REARDON has been appointed WPA director for Seneca county, Ohio, to succeed Samuel Matthews.

BEN G. KING, for two years associate utilities engineer in the Louisville, Ky. department of research and service, resigned recently to take an engineer's post with the State Public Service Commission.

MELVIN T. PATCHIN, who has served for the past 24 years as a civil engineer with the public works department of the city of Jamestown, N. Y., has submitted his resignation because of ill health.

MILLARD K. BOWMAN, who resigned the position of sanitary engineer of Franklin county, Ohio, on April 15, has been appointed senior designing engineer in charge of construction of a new power house boiler unit of the Columbus, Ohio, municipal light plant. Mr. Bowman, after

his graduation in 1909 from the College of Engineering of Ohio State University, served 3½ years with the Columbus engineering department, seven years with the city engineer's office in Los Angeles, Calif., five years with the New York Coal Co., and ten years as senior assistant to the Franklin county sanitary engineer.

OMER E. MALSBURY, assistant engineer in the municipal engineering division of the Panama Canal Zone, has taken final leave of absence, and after termination of leave will practice consulting engineering in Panama City. Mr. Malsbury has been connected continuously with the Panama Canal since 1905 except for 1½ years of wartime service as captain and major in the Engineering Corps of the U. S. army. He was also assistant construction engineer for the inter-American highway for a year in 1935, but he remained connected with the Panama Canal during that time. Mr. Malsbury graduated in civil engineering from the University of Missouri in 1905 and immediately began service as a rodman with the Isthmian Canal Commission. A few years later he became junior engineer for the Panama Railroad and the Isthmian Canal Commission and in 1913 he became assistant engineer of the Canal Commission, holding that position until his war service. He was discharged with the rank of major in 1919 and was reemployed with the Panama Canal as, in turn, assistant engineer, chief of the section of surveys, and assistant engineer on the Alhajuela basin and joint land commission survey. He served on boundary commissions for various towns and oil company concessions in Central America, and in 1925 he was an engineer for the Tacna-Arica boundary commission. From 1925 until 1935 he was civil engineer, acting designing engineer, and assistant construction engineer on the Madden dam project. Mr. Malsbury is now 55 years old.

Obituary

S. P. SUNNERGREN, 83, who retired in 1925 as chief draftsman and surveyor for the Denver & Rio Grande Railroad, died in Denver April 10.

G. HERBERT BRAZER, for the past 32 years a partner in the firm of J. R. Worcester & Co., Boston, Mass., died in Brookline, Mass. Apr. 20 at the age of 64. Mr. Brazer had been connected with the Worcester company since 1899, being connected with many major structural projects of that concern in New England and elsewhere.

WALTER B. GRIGSBY, chief engineer of the commercial engineering division of Rex Cole, Inc., and assistant plant and training officer of the 14th regiment of the New York National Guard, died Apr. 18 in New York City at the age of 44. Mr. Grigsby graduated in civil engineering from Lafayette College in 1916. He entered the engineer training school at Fort Leavenworth as a second lieutenant, was later assigned as a first lieutenant to the 305th Engineers, and then was transferred to the 9th Engineers Mounted. He served on the Mexican border with the mounted engineers and was discharged in 1919 and entered on the R.O.T.C. list as a captain.

LARGER AWARDS FOR THE WEEK

Brewery, Fontenelle Brewing Company, Kansas City, Mo.	$500,000
Mine buildings, Lake Chelan Copper Mining Company, Lucerne, Wash.	3,000,000
Electrolytic zinc plant, Sullivan Mining Company, Kellogg, Ida.	1,000,000
Coal tipple, United Electric Coal Company, Peoria, Ill.	500,000
Apartments, Dundalk Housing Corporation, Dundalk, Md.	800,000
Residential development, Wilson Sullivan, Inc., Albany N. Y.	1,250,000
Housing development, Grandyle Land Corporation, Grand Island, N. Y.	500,000
Office building, Apartment Service, Incorporated, Dallas, Tex.	1,250,000
Highways, Wisconsin	1,133,000
Highways, Washington	500,000
Highways, South Carolina	1,121,000
Highways, Missouri	968,000
Bridge, State Highway, Pa.	504,000
Dam and power plant, Cataract Falls development, Cumberland County Power and Light Company, Saco, Me.	500,000
Railroad change in connection with grade crossing elimination, High Point, N. C.	500,000
Power sub-station, Narragansett, Electric Company, Providence, R. I.	500,000

INDEX NUMBER

ENR Cost	1913 = 100	1926 = 100	ENR Volume	1913 = 100	1926 = 100
Apr., 1937	230.25	110.64	Mar., 1937	147	64
Mar., 1937	225.25	108.18	Feb., 1937	181	79
Apr., 1936	202.20	97.20	Mar., 1936	160	70
1936 (Av.)	206.46	99.24	1936 (Av.)	185	81
1935 (Av.)	195.22	93.84	1935 (Av.)	135	58
1934 (Av.)	198.10	95.23	1934 (Av.)	114	50

CONTRACTS
(Thousands of Dollars)

	Weekly Average Apr. 1936	Prev. 4 Weeks	Week Apr. 29 1937
Fed. Government	$1,386	$3,539	$1,965
State and Municipal	24,965	18,068	16,488
Total public	$26,351	$21,607	$18,453
Total private	12,741	22,566	21,811
Week's total	**$39,092**	**$44,173**	**$40,264**

Cumulative to date:
1936 (18 weeks).....$796,201,000
1937 (17 weeks).....$736,017,000

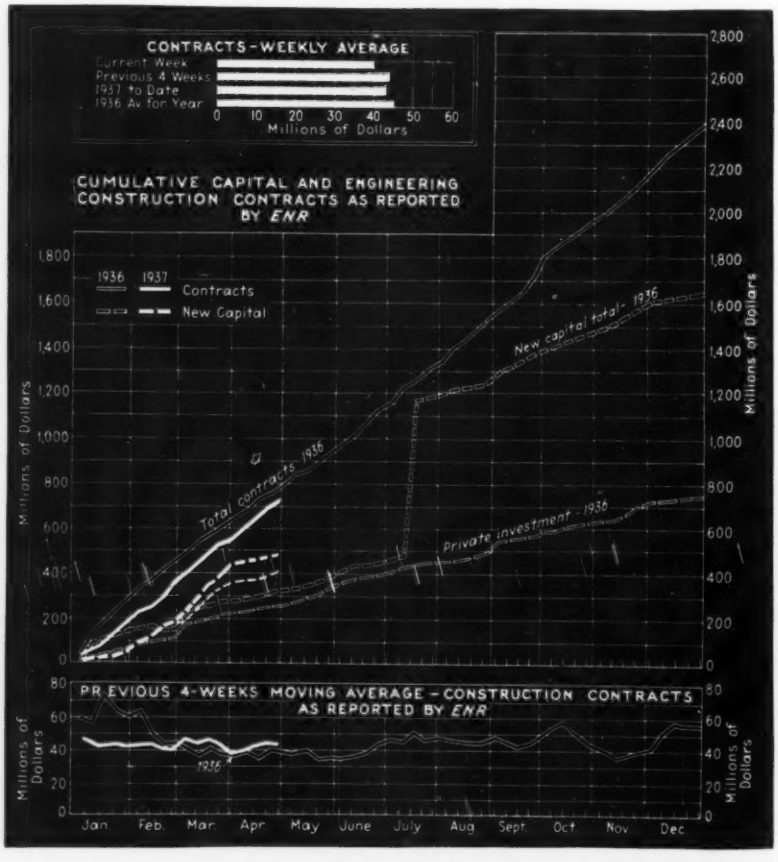
Note: ***Engineering News-Record*** **reports waterworks and earthwork, reclamation or waterways projects of $15,000 and over in size; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000 and over. The figures above represent the volume of contracts and large force account projects throughout the U. S. that are of these minimum sizes or over.**

NEW PRODUCTIVE CAPITAL
(Thousands of Dollars)

1937	Week Apr. 29	Cumulative
Private investment	**$11,527**	**$410,203†**
State and municipal bonds	9,938	184,590†
Corporate securities	1,589	225,613
Federal financing	**$1,276**	**$77,267†**
PWA non-federal Projects	1,276	48,135†
R.F.C. Loan	.....	29,132
Total non-federal	**$12,803**	**$487,470**
Federal projects	.....	.....
Total	**$12,803**	**$487,470**

Cumulative to date:
1936 (18 weeks).....$353,192,000
1937 (17 weeks).....$487,470,000

Note: These figures include private bonds and stocks sold for new construction purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities. RFC direct purchase of bonds for "self liquidating" projects, and 25 per cent of WPA construction appropriations.
† Includes transfer from federal to private investment financing through sale by RFC of PWA bonds.


CONTRACTS - WEEKLY AVERAGE
Current Week
Previous 4 Weeks
1937 to Date
1936 Av. for Year
0 10 20 30 40 50 60
Millions of Dollars
CUMULATIVE CAPITAL AND ENGINEERING CONSTRUCTION CONTRACTS AS REPORTED BY ENR
1936 1937
Contracts
New Capital
New capital total 1936
Total contracts 1936
Private investment 1936
Millions of Dollars
PREVIOUS 4-WEEKS MOVING AVERAGE - CONSTRUCTION CONTRACTS AS REPORTED BY ENR
1936
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Municipal Equipment and Materials

Great Accuracy Claimed For New Chlorinator

Accuracies of better than 99 per cent are claimed by the Everson Mfg. Co., 214 West Huron St., Chicago, Ill., for their new Rota-Meter chlorinators, intended for use in waterworks and sewage plants. The line of chlorinators is furnished in capacities ranging from ½ lb. to 1000 lb. of chlorine gas per 24 hours. Each model has a ratio of 1 to 10 between its maximum and minimum capacities.

The accuracy of the device is stated to be due to its Rota-Meter, a new gas flow measuring device which consists of a silver rotor supported by a column of gas in a tapered calibrated tube. Shaped like a tiny top, the rotor spins by means of flutes or fins suspended in the calibrated tube, its position on the scale indicating the flow.

The chlorinators come in two styles, the skeleton and the enclosed type.

Movable Floors Dump Load From New Truck Body

The Loryflor, a movable floor for truck bodies which is said to simplify loading and unloading, has been introduced into this country from England by the Easton Car & Construction Co. This new floor consists of a single sheet of durable cord rubber belting supported underneath by tiers of steel rollers. The belting is long enough to be rolled one complete floor length to either end of the truck; this complete movement of the floor from end to end of the body provides a new method of loading and unloading.

The Loryflor is operated by means of a crank handle which is used to roll up the floor. The operator may use this handle at either end or either side of the truck.

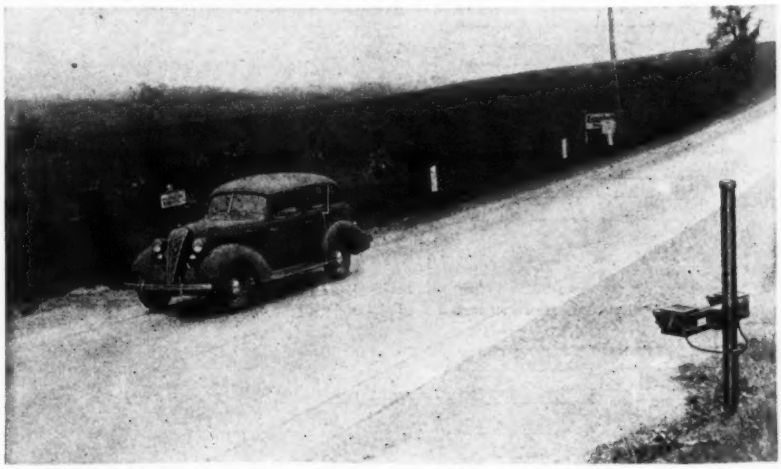
It is stated that almost any type of load, such as sand, coal, bags, packages, or large pieces of heavy machinery, can easily be handled by the Loryflor, and it is also claimed that the smooth action of the Loryflor as compared with tilting dump bodies, greatly reduces the wear on the truck chassis.

ONE OPERATOR dumps a load of castings with the Loryflor

Photo-Electric Auto Counter

An automatic traffic recorder for counting and recording the number of vehicles passing a given point has been developed by International Business Machines Corp.

The recorder is composed of two units placed on opposite sides of the road. One consists of two light sources several feet apart, screened so that only the invisible infra-red rays are projected across the road. The other unit has two lenses placed to receive these light rays and conduct them to a photoelectric cell.



THE CAR must block both beams to be counted

Interruption of both light beams by a vehicle causes the cell to actuate a counting and recording mechanism. At the end of each hour the mechanism prints the cumulative total on a tape, together with the hour and the day of the week. It can register 400 impulses a minute and can record 99,999 impulses. The device contains a 300 day supply of tape and will operate for 8 days at a time without attention.

Pump for Underpass Drainage

The Worthington Pump & Machinery Corp., Harrison, N. J., announce that they have adapted their Freflo centrifugal pumps to underpass drainage, pumping directly from the catchbasin. A simple catchbasin or sump and an inexpensive housing are said to be the only equipment required.

Freflo pumps for underpass drainage are built ready to install, with the foundation plate and driving head frame of heavy fabricated steel supporting the entire weight of the pump and driver.

Pump Handles Corrosive Liquid

A single-suction centrifugal pump especially designed to handle corrosive liquids is furnished in a wide selection of special alloys by the Lawrence Pump & Engine Co., Box 70, Lawrence, Mass.

It is stated that the adaptability of the design of the Type SC Lawrence Vortex pump permits the maker to meet each user's individual requirements, whether he is pumping dilute or heavy acids, sulphites, alkalis, oils, hot or cold water, or almost any other liquid.

Some of the materials available are stainless steel, pure nickel, monel metal, Everdur, acid bronze, lead, and aluminum. In certain cases pumping conditions are met by making the entire pump of a special alloy, while in others the casing will be made of one metal and the rotating parts of another.

Ball bearing construction, extra deep stuffing boxes, and a vertical split casing which makes all parts readily accessible, are features of the design. For high vacuum operation, a stuffing box with an outside type of pot seal is available.

Remote Reading is Provided In New Flow Meter

In the new electrically operated flow meter, the Synchro-Meter, developed by the Bailey Meter Co., Cleveland, Ohio, a transmitter is located at the point of measurement of the variable and the receiver is located at a place or places convenient for obtaining readings from the instruments as frequently as desired. The Synchro-Meter consists of a transmitting unit operated by a Ledoux bell flow measuring mechanism of the type used in standard Bailey mechanically-operated fluid meters and a receiver consisting of the indicating, recording, and integrating instruments.

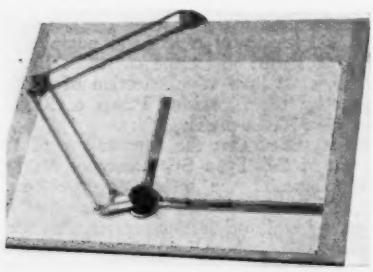
A number of advantages are claimed for the Synchro-Meter. The transmitter places only a negligible retarding force on the measuring device, and the torque developed to operate the receiving element is very large and does not send any reaction back to the transmitter. No adjustments of the Synchro-Meter are necessary at the transmitting end, and it may, therefore, be located in a relatively inaccessible place. Several receivers may be operated from one transmitter. Using No. 12 wire, the transmitter may be located about a mile from the receiver, and if larger wire is used a greater distance is allowable, providing the loop resistance does not exceed 20 ohms.

Large Drafting Machine

A drafting machine that will make drawings as large as 28 in. by 38 in., the new model R-300 Wrigraph, is being manufactured by L. G. Wright, Inc. and sold through the Wrigraph Sales Division, 5213 Euclid Ave., Cleveland, Ohio.

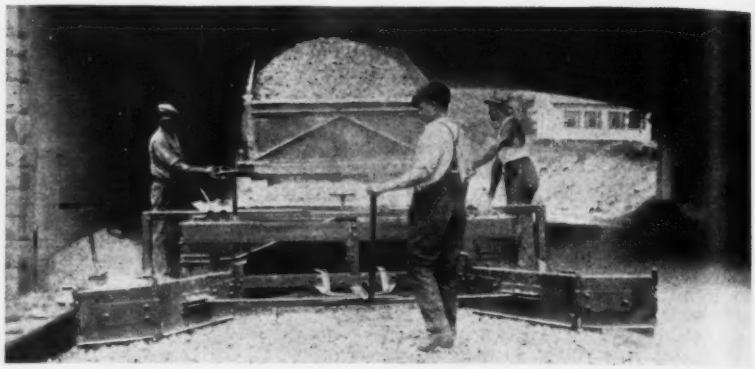
A mounting clamp holds the machine, which is self levelling, onto any drawing board. The permanently calibrated parallel mechanism is assembled with eight Fafnir precision ball bearings, pre-lubricated and sealed at the factory. Aluminum alloy castings are used for this mechanism.

The indicating protractor is of a new type, with which 1 deg. angles can be



attained in one operation. The protractor may be clamped rigidly against rotation, and an automatic stop makes it possible accurately to return the protractor to zero position. The interchangeable scales are of duralumin and the graduated drawing edges in the scales are of transparent pyralin.

The model R-300 Wrigraph is priced at $44.50 complete, with one 12-in. and one 18-in. scale graduated in sixteenths. All standard architectural and engineering graduations are said to be available.



FINISH SPREADER HAS FEW MOVING PARTS

THIS ADNUN Finish Spreader, manufactured by the Foote Co., Inc., of Nunda, N. Y., is designed to handle and spread all types of road stone, slag, gravel, and cinders. Its use is said to eliminate the need of a grader and to avoid waste of materials and overrun.

Among the advantages claimed for the spreader are a low first cost arising from the simplicity of design and a low maintenance expense due to the fact that there is no engine and few moving parts. Accuracy is said to be provided by long guide rails which span the small irregularities that may be present.

The Adnun finish spreader will shape any crown or bank, it is stated, and the crown or bank contour can be changed while in motion. The spreading width is variable and may be adjusted up to 11 ft. Material can be laid right up to the curb.

New Equipment in Brief

Shovel—Stainless steel is used for the blade of a new shovel manufactured for use in the handling of corrosive substances by the Ames Baldwin-Wyoming Co., North Easton, Mass. The shovels are manufactured in hollow back, round, and square point styles.

Laboratory mixer—A mixer which will prepare a batch of bituminous material in quantities of 40 lb. or less for laboratory use, the McGrane Laboratory Pug-Mill mixer, is manufactured by Frank B. McGrane, 44 Bigelow St., Quincy, Mass. The mixer unit is driven by a totally enclosed half horsepower motor with speed reduction from 1,200 r.p.m. to 70 r.p.m. through silent roller chain. The mixer has manganese plate liners, high carbon steel shaft, and special process steel mixing blades.

Tar kettle—The new model 84-HB-6 tar and asphalt heating kettle developed by Littleford Bros., 415 Pearl St., Cincinnati, Ohio, is designed along lines similar to those of the Littleford No. 84-HB model but somewhat enlarged. The kettle is rated at 300 gal. but is stated to have an actual capacity of 350 gal. Various changes in design, principally a reduction in weight to 2,250 lb., have permitted the use of single pneumatic tires on the kettle, which is trailer mounted, and also permit a lower price than other Littleford kettles of similar capacity.

Mechanical interpolator—The Contourpolator, manufactured by the Engineering Devices Co., 763 Dawson St. New York City enables the draftsman to interpolate contours on maps from spot elevations without computation. The device consists of a celluloid sheet on which numbered converging lines are crossed by a series of parallel grooves cut through the sheet. The draftsman places the zero line over one elevation point and places the Contourpolator so that the other point lies on the intersection of some parallel line with the converging line whose number corresponds to the interval between the points. The contour points may then be spotted at once.

Portable generator—D. W. Onan & Sons, 43 Royalston Ave., Minneapolis, Minn., have redesigned their line of portable generators which are intended to supply 350 to 1000 watts of alternating current in a truck or trailer mounting, reducing weight and dimensions. New features of these gasoline-operated fully enclosed generators include: arrangement for servicing the plant entirely from the exhaust side, permitting installation in close quarters; welded all steel generators with special cooling; vacuum crank case ventilation; and starting from an auto-type battery with remote control.

Black Line Printer

A simple continuous printer designed for exposing BW black-line paper or blueprint paper has been developed by Charles Bruning Co., Inc., 102 Reade St., New York, N. Y. The machine exposes paper of any width up to and including 42 in. It operates on 100 volt a.c. and 110 volt d.c. from any light socket and is said to consume less current than the usual arc lamp machines.

In the production of black line prints, the new Bruning BW printer is intended to be used in conjunction with the Bruning black and white developing machine. To obtain a black line print from tracings or drawings, the paper is exposed in the new printer, and the print is then developed in any regular BW developing machine and is immediately ready for use without washing or drying.

The manufacturer states that a single operator, using the new BW printer with average tracings on cloth, can print and develop two or three 50 yd. rolls of black line paper every day.